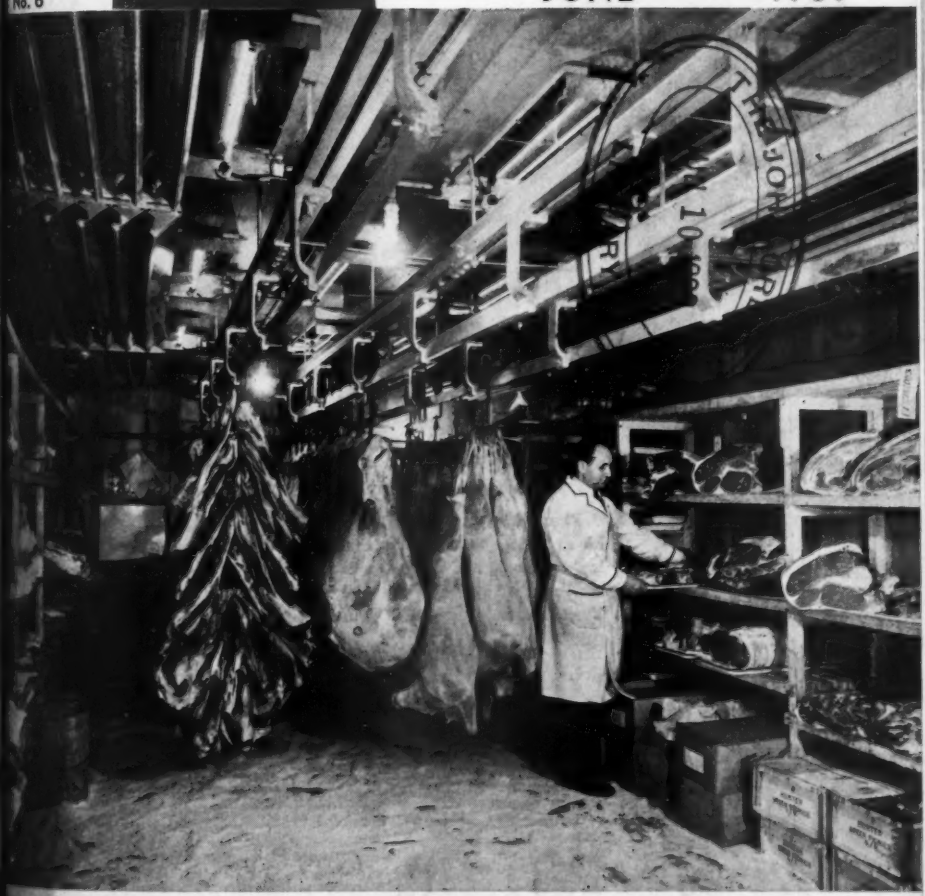
The Refrigeration Service Engineer

Vol. 7
No. 6

JUNE • 1939



ENTSCHLERIZING AN AID TO
REFRIGERATION • SERVICING THE
METER-MISER • SERVICE KINKS

THE REFRIGERATION SERVICE ENGINEER. Nickerson & Collins Co., Publishers. 435 N. Waller Ave., Chicago, Ill. Published monthly. Vol. 7, No. 6, June, 1939. Entered as second class matter March 4, 1938, Chicago, Ill., under the Act of March 3, 1879. Subscription in United States, $2.00 per year; all other countries, $3.00 per year.

It costs less to buy a BETTER PRODUCT

Careful buying requires that you weigh initial cost against the standard of performance you expect from what you purchase. Price is important, but equally important is functional efficiency.

Henry passes both these tests with flying colors. Henry products are competitively priced, and lead in advanced engineering design, exclusive features of construction, and range of size and type. Products of a quarter-century of manufacturing experience, their widespread trade acceptance proves superiority.

Moreover, when you buy Henry products you get more than better operation. They safeguard you against expensive "call backs." Ask any man who has experience specifying, buying or installing Henry products—he'll tell you that they really cost you less.

TYPE 744
CARTRIDGE DEHYDRATOR
Easy to refill with new dehydrant cartridge.

TYPE 709 DEHYDRATOR
For small refrigeration units.

TYPE 882 STRAINER—With Felt Sack Inexpensive. Screw Cap. Easy to clean.

WRITE FOR NEW 1939 CATALOGS

Catalog 84—Dryers, Strainers and Large Line Valves for Freon, Methyl Chloride and Sulphur Dioxide.

Catalog 53—Ammonia Valves and Forged Steel Fittings.

Most Complete
LINE OF DRYERS, STRAINERS AND LARGE LINE VALVES FOR REFRIGERATION AND AIR CONDITIONING—ALSO AMMONIA VALVES AND FORGED STEEL FITTINGS

HENRY VALVE CO.

1001-19 No. Spaulding Ave. • Chicago, Ill.

Users Prove Everything We Claim for the POLARTRON SYSTEM

"Since installing your Polartron we have noticed that shrinkage and deterioration of foods has been virtually eliminated. Frosting of the pipes and radiator fins has been entirely overcome. The controls will pay for themselves in a short time." W. O. WHEELER---WHEELER CATERING CO. INDIANAPOLIS, IND.

"Since the Polartron System has been installed, we are maintaining an average temperature of 33 degrees. Coils are always clean and our trimming has been reduced to a minimum." H. H. ROSSMAN - ROSSMAN & PALMER LA GRANGE, ILLINOIS.

"Since your system was installed, the cooling coils have been entirely free from frost and constant temperatures have been maintained within two or three degrees of thermostat setting. We are pleased now to be able to change the temperatures in these fixtures by simply adjusting the thermostat." MILO L. MINKIN - LINWOOD MARKET KANSAS CITY, MO.

"The Polartron System has eliminated our frosting condition and we are maintaining the temperature we want. Our meats seem to keep much fresher for longer periods of time." WM. RICHTER - RICHTER'S MARKET ST. LOUIS, MO.

"A Polartron was installed to correct this difficulty and the room is now maintained at 32 to 35 degrees without difficulty and with not a sign of ice or frost on the cooling surface." LEONARD REED - COONEY REFRIGERATING CO., INC. BUFFALO, N. Y.

The Exclusive M-H INTERLOCKING SERIES 10 CIRCUIT Does It!

MINNEAPOLIS-HONEYWELL Polartron System

A GOOD LINE TO SELL

Cash in on the Reputation of

GR-LIPMAN EQUIPMENT!

Lipman
AUTOMATIC REFRIGERATION
GR
AIR CONDITIONING

When you recommend or sell GR-Lipman Commercial Refrigeration and Air Conditioning you know, in advance, that the customer is going to be satisfied. You are ahead both in terms of *good will* and *profit*. You can stake your reputation on this equipment.

If you are an "old-timer" in the refrigeration servicing field, you probably know from personal contacts, that Lipman Machines were giving good accounts of themselves more than 20 years ago. Many of these old installations are still doing full duty, to the complete satisfaction of their owners. Basically sound in design and construction, GR-LIPMAN compressor units have, in addition, exclusive patented features which add to dependability, efficiency, operating economy, and low upkeep cost. The line includes a full range of sizes from ¼ to 40 H. P. Air- and water-cooled; Freon, Methyl Chloride and Ammonia types. And now . . . "packaged" Air Conditioning units for domestic and commercial use . . . with an almost unlimited sales market!

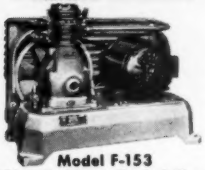
You know the people who need this kind of equipment. Let us help you "cash in" on your contacts. We have an interesting proposition for service-dealers in territories that are still open. Get the facts, at our expense. Use the coupon and the postage-free address label, provided for your convenience. Do it today!

GENERAL REFRIGERATION CORP.

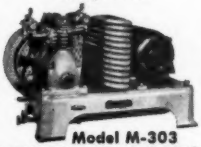
Dept. RS-639 Beloit, Wis., U.S.A.

At left is GR-LIPMAN Room Conditioner . . . available in 2 models. At right: GR-LIPMAN self-contained Store Cooler and Air Conditioner . . . 3 models.

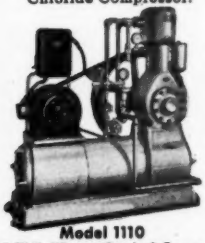
● **FREON** ● **AMMONIA**
● **METHYL CHLORIDE**



Model F-153
1½ H.P. Water-Cooled Freon Compressor



Model M-303
3 H.P. Water-Cooled Methyl Chloride Compressor.



Model 1110
10 H.P. Water-Cooled Ammonia Compressor

Cut out this label and paste it securely to an ordinary size envelope.

By the Authority of the **Post Office Department of the United States**, General Refrigeration Corporation Offers a **New Postage Prepaid Label** for your convenience ➡

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY LABEL
First Class Permit No. 56, Sec. 510 P. L. & R., Beloit, Wisconsin

GENERAL REFRIGERATION CORPORATION
SHIRLAND AVENUE
BELOIT, WISCONSIN

General Refrigeration Corporation:

Interested in your dealer proposition. Without obligation, send full details.

Name_____

Address_____

_____

Virginia Refrigerants and Supplies

EXTRA DRY ESOTOO

ANHYDROUS LIQUID SULFUR DIOXIDE

Produced under rigid laboratory control to insure unusual purity, dryness, dependability. Available in 5, 10, 35, 70, 100, and 150 lb. cylinders, and in multi-unit tank cars.

V-METH-L

METHYL CHLORIDE

High purity, extremely low acidity, meeting highest specifications of manufacturers of equipment designed for it. Shipped in 3½, 6, 20, 40, 60, 90, 130 lb. cylinders, and in multi-unit tank cars.

METHYLENE CHLORIDE

Refrigeration grade, used in centrifugal compressor systems. Supplied in 1 and 5 gal. cans and in 300 and 550 lb. drums.

DRIERITE

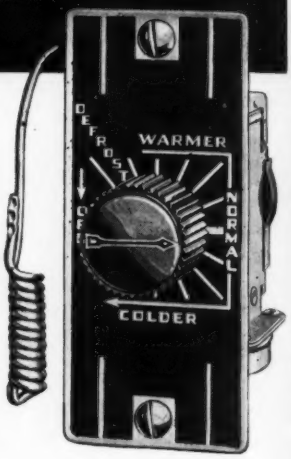
Solid drying agent. Highly efficient, absolutely neutral, easily renewable. More economical than liquid types. Does not contaminate or change characteristics of any refrigerant. Packed in 1 lb. screw-capped metal cans.

SEE YOUR VIRGINIA JOBBER

VIRGINIA SMELTING CO.

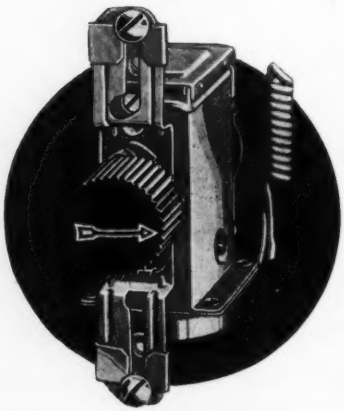
WEST NORFOLK, VA.

You Asked for it— *RANCO Built It!*



A GENERAL Replacement Control E-A-S-Y to Install—

RJS-830



MORE time saved for service men! This Ranco General replacement of wide adaptability is extremely easy to install — either vertically or horizontally. Single dial—fits practically all household refrigerators.

Mounting brackets of RJS-830 have wide adjustment to fit all control mounting spacings. The dial pointer may be rotated on its shaft to line up with printed evaporator shields. A long dial pointer shaft permits clearance for the pointer regardless of the thickness of the shield and dial plate.

Ranco quality! Ranco dependability! At the right price. Ask your Ranco jobber.

Ranco INC. Columbus, Ohio

The Refrigeration Service Engineer

Vol. 7 No. 6

June 1939

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

Official Organ
REFRIGERATION SERVICE ENGINEERS SOCIETY

Cover

This month's front cover shows fifteen "Sterilamps" in operation in a 13 ft. x 33 ft. refrigerator installed in the Stop and Shop Market in Quincy, Mass. The equipment was installed in November, 1937 and has been in operation ever since. See article on page 11 on the "Sterilamp."

Published by
Nickerson & Collins Co.
433-435 North Waller Ave.
Chicago
Telephones Austin 1303-1304-1305

EASTERN OFFICE
420 Lexington, New York City
Telephone Lexington 2-4816

Publishers of Technical Books and Trade Journals Serving the Refrigeration Industries for 48 years.

Subscription Rates United States $2.00 per year. Single copies 25c. All other countries $3.00 per year.

TABLE OF CONTENTS

The Refrigeration Service Engineer

Vol. 7, No. 6 CHICAGO, JUNE, 1939 $2.00 per Annum

Rentschlerizing, an Aid to Refrigeration

By T. R. PORTER *

BUTCHERS are starting to install in their refrigerators a system for directly reducing bacterial and mold spoilage. The system is supplementary to the refrigeration process, and is called Rentschlerizing. It supplements refrigeration by reducing the number of bacteria and of mold spores which the low temperature is called upon to make inactive.

The new and interesting part of the Rentschlerizing equipment is an ultraviolet sterilizing lamp called "Sterilamp[1]." It is a tube about half an inch in diameter, made of special glass, and in lengths of 10, 20 and 30 inches. Several kinds of fixtures are available for holding the tubes and reflecting the ultraviolet. A power unit for operation of from one to six Sterilamps[1] in series consists of a transformer, a protective relay and a starting button, all in an iron box 11 inches x 8⅝ inches x 4 11/16 inches.

Electrically, the Sterilamp[1] is a low pressure mercury discharge tube, started by a high voltage surge of 400 to 750 volts and operated in series with a high inductance at a current of .03 to .05 amperes. Overall power consumption is about 14 watts for the 30-inch tube, and less for the shorter. Sterilamps[1] are designed for operation from alternating current circuits of 105 to 125 volts. If 220V. A.C. circuits only are available a stepdown transformer must be used. Converter is required for use in D.C. districts to transform the power to A.C.

The Sterilamp[1] is a very efficient generator of selective wavelengths of ultraviolet peculiarly deadly to bacteria and mold. In fact, it is the first practical generator efficient enough to be utilized in refrigerators. Because of its high efficiency, it gives only a small amount of visible light and very little heat. Its addition to the refrigeration load, when installed inside a refrigerator, is negligible. Over 80 percent of its radiated energy is generated in the region of 2537 angstrom units wavelength of ultraviolet radiation, which has been proven to be highly effective for bactericidal purposes.

Most of the well-known fundamentals for

* Special Products Department, Westinghouse Lamp Division, Westinghouse Electric & Manufacturing Co.

[1] Trade mark registered by U. S. Patent Office.

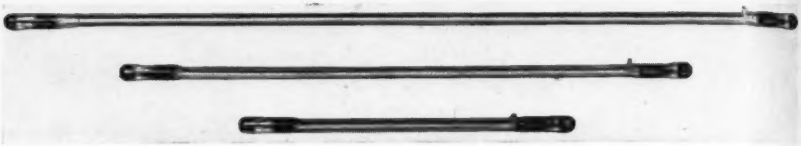


Fig. 1.—Three sizes of Sterilamps,[1] with nominal lengths of 10, 20 and 30 inches.

operating walk-in boxes must be revised when Sterilamps [1] are used as an adjunct to refrigeration. In explaining the reasons for revising these rules, some consideration may be given to the fundamentals of meat preservation.

Refrigeration makes germs lazy; it does not kill them. The colder the box, the more inert are germs and mold spores within it. Were it not for practical difficulties, butchers would keep their boxes far below freezing to reduce spoilage. Two of the greatest difficulties preventing this are the unavoidable drying out of meat surfaces which become dark and require wasteful trimming, and actual losses of weight in meat. Water evaporating from meat surfaces deposits on the freezing coils as frost and the humidity in the box thus is kept so low that the air soaks up water from the meat like a sponge. If the cooling coils could be run above 32 degrees, no frost would form, humidity would remain high and meat would neither lose much weight nor darken easily.

When some of the responsibility for reducing bacterial spoilage is lifted from the cooling process by the ultraviolet radiation, the temperature can be raised. Careful field tests over five years have proved that it can be done, and these tests have formed the basis for very definite rules governing installation and operation of Rentschlerizing in walk-in boxes.

The following elements are essential, each one of them supplementing the other and unless these elements are in proper balance,

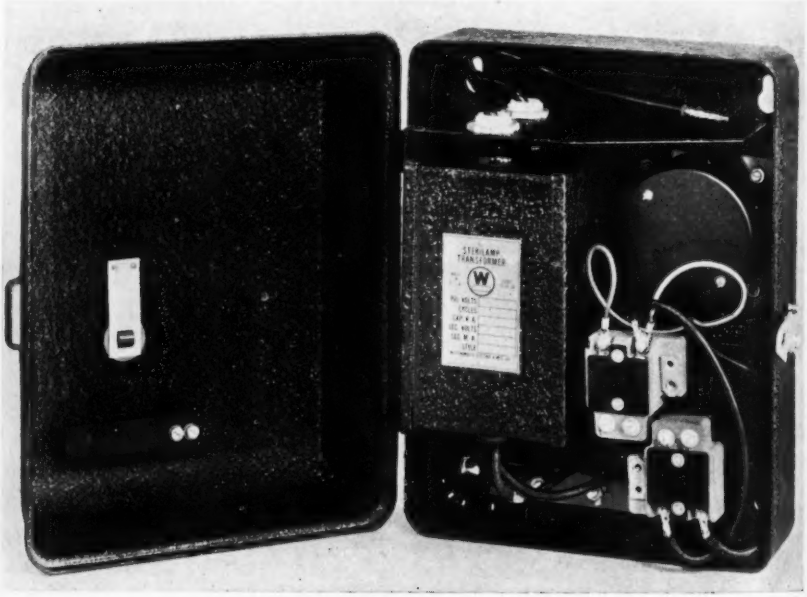


Fig. 2.—View of open control box, containing all Sterilamp [1] auxiliary equipment for operation of from one to six Sterilamps [1] in series.

and properly controlled, the maximum benefits from the Rentschlerizing process cannot be obtained.

1—Selective ultraviolet radiation.
2—Controlled temperature.
3—High relative humidity.
4—Proper air circulation.

The following explanation may clarify these elements:

1—Selective ultraviolet radiation. Radiation must be installed in the quantity recommended by the manufacturer, and the Sterilamps [1] must be positioned as recommended. Radiation will kill bacteria and mold spores floating in the air, and will reduce development on meat surfaces. Its effect will extend to shaded portions of meat, not in direct line-of-sight of the tubes.

2—Controlled temperature. Temperature must be raised by an amount determined by experiment for each installation, but the final temperature of operation is preferably between 38 degrees F. and 42 degrees F.

3—High relative humidity. In some cases, temperature increase alone will raise the humidity sufficiently; in other cases a humidifier must be installed. In any case the relative humidity should be raised to between 85 percent and 90 percent.

4—Proper air circulation. In some crowded refrigerators operation will be improved by circulation of the air with one or more electric fans, positioned as recommended by the manufacturer. Ordinary electric fans are not satisfactory, but the manufacturer of the Sterilamp [1] has developed a fan for this purpose. Without air circulation the radiation alone will not have adequate effect on those meat surfaces not directly reached by the ultraviolet radiations. Air circulation also promotes more uniform temperatures throughout the box.

Costs of Material

The cost of adding the Rentschlerizing process to a small box will run between $50.00 and $100.00 for material. Sterilamps [1] should be kept in operation for 24 hours a day, every day, and are designed to remain effective for six months.

List Prices

10 inch Sterilamp [1]	$ 8.00
20 inch Sterilamp [1]	9.00
30 inch Sterilamp [1]	10.00
Power Unit	30.00
Fan, special, 8 inch, 115V, 60 cycle, for low temperature	12.00

GLYCERINE VALUABLE AID IN AIR CONDITIONING

WITH the rapid development of air-conditioning as a major industry devoted to the health and comfort of mankind, the unique properties of glycerine are finding new use as an agent for removing excessive moisture from the air, particularly during the summer months when the humidity is so high. For many years glycerine has been valued and employed, both in this country and abroad, as a drying medium for gases. Since air is but a mixture of gases, technicians of the new industry of air conditioning have found that glycerine works as efficiently in air-conditioning plants as it does in gas-producing units.

Glycerine is employed in air-conditioning because it is a hygroscopic material, which absorbs moisture without chemical reaction. It particularly fits into the needs of an air-dehumidifier by being stable, non-corrosive, non-poisonous, non-combustible and capable of being readily re-concentrated. In a discussion, "Chemical Dehumidification of Air," (Chemical and Metallurgical Engineering, 45:418, 1938), A. Weisselburg says of glycerine, "With such an absorbent it is therefore possible to remove much moisture and the corresponding amount of latent heat per unit weight of absorbent without much variation in the condition of the dehumidified air."

Further research in this comparatively new field of endeavor will doubtless find increasing advantage in the use of glycerine as an air-dehumidifier.

S S S

H. L. Weems
Mississippi

I have been a regular reader of THE REFRIGERATION SERVICE ENGINEER for two years, and think it's swell.

Samuel Alexander
California

Will you please renew my subscription? I find your magazine very helpful.

M. N. Smith
West Australia

Enclosed please find three one dollar bills, as subscription for THE REFRIGERATION SERVICE ENGINEER, which publication contains much helpful information. Best wishes for its success.

The Frigidaire Hermetic Unit

A complete description of the construction, operation, electrical system, wiring connections, field service and shop data on the domestic units.

THE first hermetic units manufactured by Frigidaire were placed on the market in 1933. While only two of the smaller model cabinets were equipped with sealed units at that time, during succeeding years, all domestic models were equipped with hermetics. The large number of these units sold and installed since 1933 represents a very attractive potential field of service to the service engineer, but due to the fact that the unit contained a gas (F-114) which was controlled entirely by Frigidaire, and because they would not permit its use outside of the factory, it has been impossible to service these units to any extent.

Recently, a new gas, known as "Herveen," has been placed on the market which can be used to replace F-114 in the Frigidaire, thereby opening up a new field of service to the independent service organization.

The Frigidaire hermetic is perhaps the most simple, most easily repaired unit of any hermetic type. In addition, the sealed unit dome, Figure 1, containing the motor and compressor is so small that it can be easily handled while opening without any special equipment.

Construction and Operation

Compressor.—The compressor dome shown in Figure 1 contains a split-phase motor and a rotary type compressor which are directly connected. Several sizes of motors are used and the motor h. p. is usually marked on the name-plate of the unit located at the top of the condenser. The motor rotor carries an eccentric, around which an impeller is fitted. The suction and discharge chambers of the compressor are separated by a divider block which is held against the impeller by the pressure of springs. The divider block moves in the slot of a stationary cylinder. A flapper type discharge valve is located on the top of the cylinder block. The motor and compressor operate in the vertical position within a welded steel casing. This casing contains a number of radiating fins which serve to keep the temperature of the compressor within an efficient range. The compressor is submerged in oil having viscosity of about 800 seconds, which provides proper lubrication for the three moving parts. The compressor itself, in design, is similar to that of the Norge compressor. The entire motor and compressor assembly is mounted on four rubber supports which absorb any vibration that may occur.

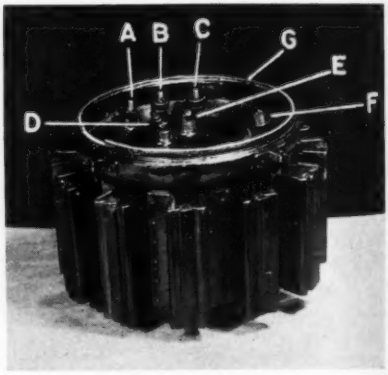


FIG. 1—BOTTOM VIEW OF DOME.
A—White Wire.
B—Red Wire.
C—Black Wire.
D—Suction Connection.
E—Discharge Connection.
F—Oil Drain Plug.
G—Weld ground off at this point.

Condenser.—The condenser (Fig. 2) is constructed of two large flat steel plates, spot-welded in a manner which permits the free flow of the refrigerant between the plates. The plates are "dimpled," which provides additional surface to the plate and creates a circuitous route for the flow of the refrigerant. The condenser has a header at the top which distributes the gas across the width of the plates, and a header at the bottom which collects the liquid refrigerant. To allow for sufficient circulation of air past the condenser, it must be set a few inches away from the wall of the cabinet which is

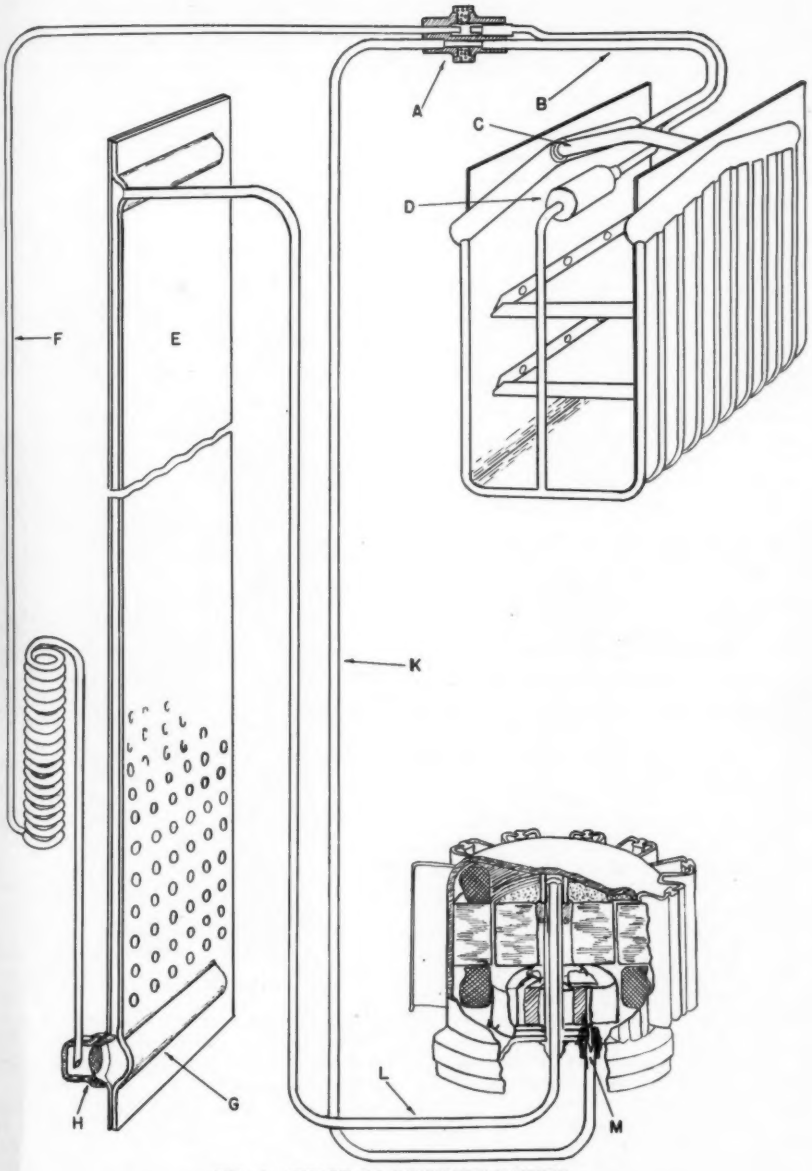


FIG. 2. CHART OF COMPLETE SYSTEM.

A—Charging ports.
B—Heat interchanger.
C—Equalizing tube.
D—Restrictor.
E—Plate condenser.
F—⅛ inch liquid line.
G—Receiver.
H—Screen.
K—Suction line.
L—Compressor discharge.
M—Suction line screen.

provided for by spacers installed on the cabinet.

The larger units employing a ⅓ h.p. motor are equipped with a finned type condenser and a separate fan motor. These units also employ a separate receiver which is mounted under the compressor dome.

Freezer.—The freezer or evaporator is made of electro-plated brass, and is of the plate type, located centrally in the upper part of the cabinet. The shelves of the freezer are low or "puddled" in the center so that a small amount of moisture gathering at this point causes the tray to freeze to the shelf, thereby forming perfect contact. Shelves in the early models contained refrigerant tubes; later models depended on contact with the sides of the evaporator only for refrigeration.

Restrictor.—The restrictor serves the same purpose as the capillary tube in other makes of refrigerating systems; the refrigerant is metered through a small triangular orifice which is nothing more than an open

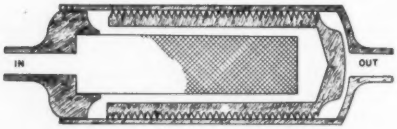


FIG. 3. FRIGIDAIRE RESTRICTOR.

thread through the restrictor. Several different sizes are in use, which vary only in the size of the thread, thereby providing sufficient capacity for the various sizes of evaporators. A screen within the body of the restrictor (Fig. 3) filters the refrigerant before it enters the restrictor, thus preventing clogging. Like capillary tubes, the orifice of the restrictor is always open and automatic unloading of the compressor through the equalization of the head and suction pressures takes place shortly after the unit stops. To further restrict flow of refrigerant, capillary tubing is used as a liquid line between the bottom of the condenser and the restrictor.

Heat Interchanger.—Heat interchangers have always been used on this unit. Some models employed the method of sweating the liquid line and suction line together for a distance of about two feet, whereas other models contain a specially constructed heat interchanger. The purpose is the same in any case, which is to increase the over-all efficiency of the system by cooling the hot condensed liquid from the condenser with the relatively cold refrigerant vapor leaving the evaporator.

Accumulators.—Some models contain an accumulator or filter trap which is located on the back of the unit and which prevents any slop-over of refrigerant from the evaporator reaching the condensing unit. (See Fig. 4.) Other models, however, depended on the construction of the evaporator itself to prevent this condition.

Temperature Control.—The unit is con-

Fig. 4. Showing the location of the accumulator on the 1933 model unit.

trolled in the conventional manner—through a thermostatic switch which includes a cold control and a defrosting mechanism. The defrosting mechanism is automatic so that when a certain temperature has been reached in the evaporator, the switch automatically snaps back in a normal operating position.

A description of the operation and servicing of the electrical system as given by Walter G. Christie and published in the September, 1936, issue of THE REFRIGERATOR SERVICE ENGINEER follows:

The Electrical System

Before attempting to describe the operation of the relay circuit, a study of the motor used on most sealed units might be helpful.

The Frigidaire sealed unit uses a split phase motor. The motor has a laminated iron armature sometimes called a "squirrel cage" armature and two separate field windings. The running winding is made up of heavy, low resistance wire. The starting winding is made up of fine, high resistance wire. When both windings are connected to the 110 volt supply, current flows in both windings simultaneously and a magnetic field revolves inside the motor frame. It revolves because of the difference in resistance of the two windings.

If only one field winding is connected to the 110 volt line, current will flow in this one field. A magnetic field will be set up inside the motor frame, *but it will not revolve.*

The revolving magnetic field drags the iron armature (squirrel cage) around as the field revolves just as a horseshoe magnet will drag a piece of iron which is held near it. *Thus the revolving field starts the motor.*

Once the armature is revolving at 1300 r.p.m., the magnetic field from one winding will keep the armature revolving. Hence, when the motor speed is up to 1300 r.p.m., the starting winding is no longer required and it can be disconnected.

The relay described in this article is the *new* type relay which is used on all the 1936 Frigidaires and which is used as a replacement on the 1933, 1934, and 1935 standard line Frigidaires.

The relay has 3 primary functions:

1. To connect both starting and running windings to the 110 volt line to start the motor.
2. To disconnect the starting winding from the 110 volt line after the motor speed has reached 1300 r.p.m.
3. To disconnect both starting and run-

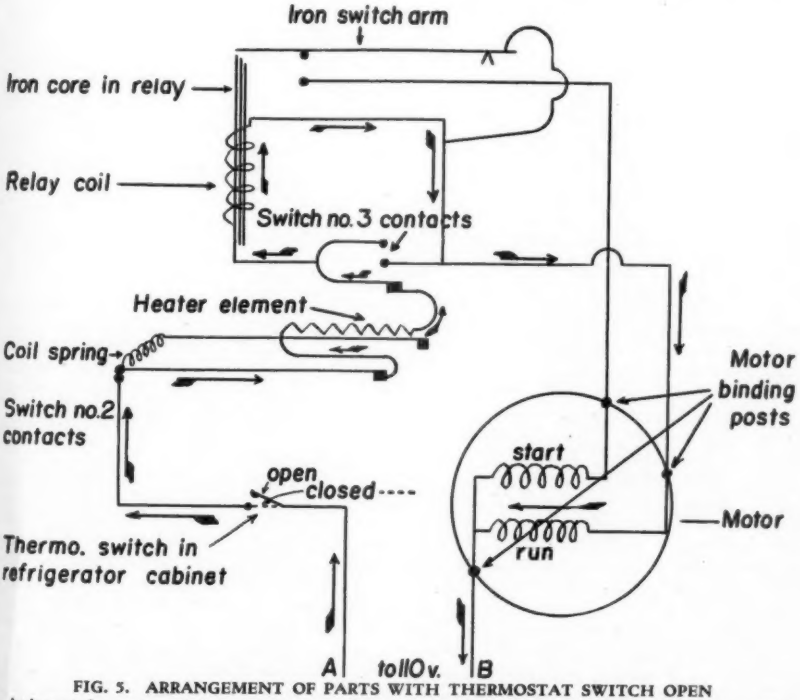


FIG. 5. ARRANGEMENT OF PARTS WITH THERMOSTAT SWITCH OPEN

At instant thermostat switch is closed, current flows from the line in the path shown by the arrows. Current flows from line at *A* through the relay and through the motor back to the line at *B*.

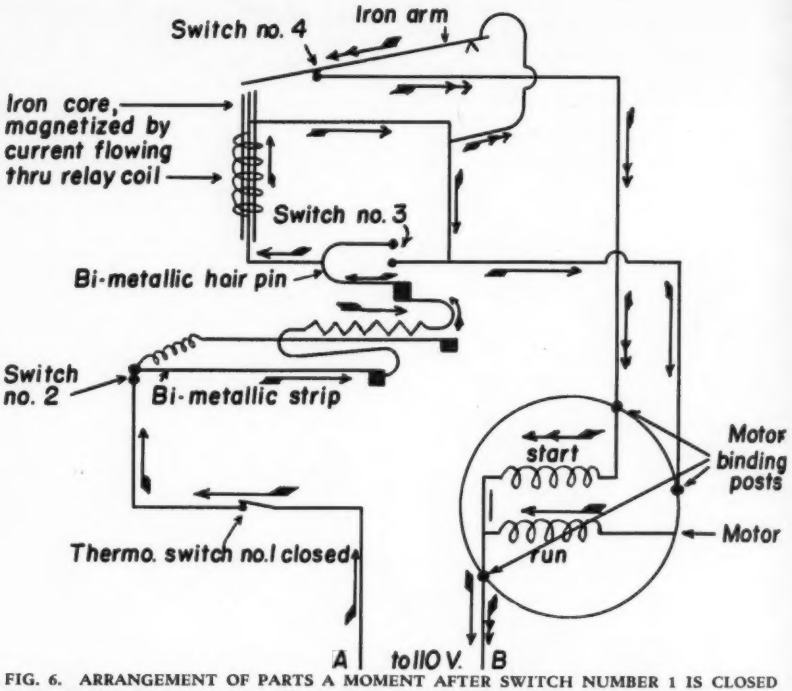


FIG. 6. ARRANGEMENT OF PARTS A MOMENT AFTER SWITCH NUMBER 1 IS CLOSED
Current flowing through the relay coil magnetizes the iron core of the coil and attracts the iron arm of SW♯4 closing contacts of SW♯4. Current then flows through SW♯4 back to the line at *B* as shown by double arrows.

ning windings from the 110 volt line in case of an overload on the motor and thus to keep the motor from burning out.

Figure 5 shows the working parts of the relay when the motor is stopped (thermostat switch on inside of cabinet has stopped machine). When the thermostat switch is closed (as shown by dotted lines in Fig. 5), current flows from the line at *A*, through the thermo switch, through the overload switch, through the switch arm, through the heater element, through the hairpin bimetallic resistor, through the relay coil, back through the running winding to the line at *B*. This flow of current should be carefully followed on Fig. 5, the arrows on the figure representing the path of the current.

This current will cause a magnetic field to exist inside the motor frame, *but the motor will not start because the field is not revolving.* In order to make a revolving field exist inside the motor frame, current must flow through the starting winding of the motor.

When the running winding current passes through the relay coil, it magnetizes the iron core of the relay coil. The relay core then attracts the iron switch arm of switch number 4, closing it as shown in Fig. 6. When switch number 4 is closed, current from the relay coil *flows* not only back through the running winding as before, but also through the switch arm of switch number 4 *back through the starting winding of the motor to the line through line B as shown by the double arrows in Fig. 6.*

The motor is now able to start because current is flowing in both running and starting windings. As explained before, when current flows in both windings simultaneously, a revolving field is set up inside the motor frame which drags the iron armature around thus making the motor start.

Switch number 2 and switch number 3 in Fig. 6 both make use of pieces of bimetal for their operation.

A bimetallic strip is made up of two dissimilar metals bonded together to form one

metal. For example, a piece of copper might be riveted to a piece of iron to form a bimetallic strip. Now all metals expand when heated but all metals do not expand at the same rate. Thus, if iron expands more than copper, when the bimetallic strip is heated, the iron side of the strip will become longer than the copper side. As a result, the strip will bend or curl. As soon as the heat is removed, the iron and copper will contract to their original length, and the strip will straighten out and assume its original shape. This principle is used in switches numbers 2 and 3.

Switch number 3 is made of bimetallic strip bent in the shape of a hairpin. When the motor current flows through the lower part of this bimetallic strip, it heats the strip and as a result, the strip starts to bend. In about 2 seconds, the strip has bent sufficiently to close switch number 3 contacts.

When switch number 3 closes, the relay coil is short-circuited, and no more current can flow through the coil. All the current must flow through switch 3 (see Fig. 7). As soon as current stops flowing in the relay coil, *the coil becomes demagnetized and switch number 4 opens.* As a result, the *starting winding is disconnected* and the motor runs on the running winding alone. As long as the motor runs, current flows through the bimetallic switch number 3 thus keeping the switch closed and the starting winding disconnected.

When the refrigerator temperature has dropped sufficiently, the thermostatic switch number 1 opens and the motor stops. The bimetal in switch number 3 cools down and the bimetal bends into its original shape so as to open switch 3 and the unit is again ready to start as shown in Fig. 5.

The Frigidaire sealed unit employs a rotary compressor without either a high side unloader valve (as used in GE and Westinghouse) or a low side check valve as used in Norge. As a result, the Frigidaire unit cannot start until the high side and low side pressures equalize. Hence, if the supply

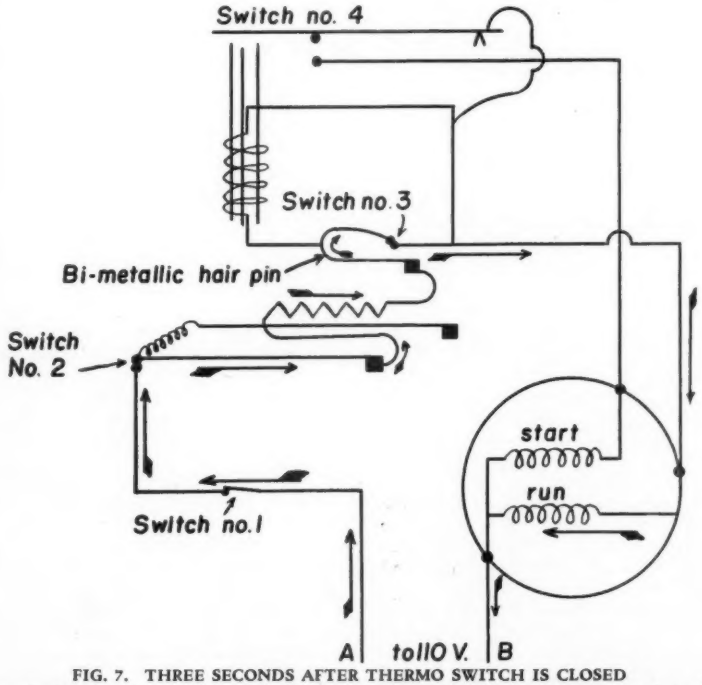


FIG. 7. THREE SECONDS AFTER THERMO SWITCH IS CLOSED

Current flowing through lower part of bimetallic hairpin (SW♯3) causes hairpin to bend and close SW♯3, short-circuiting the relay coil and opening SW♯4. The hairpin closes SW♯4 about three seconds after thermo. SW starts motor.

power should fail for a moment while the unit is running, the unit could not start until the two pressures balanced. This may take fifteen minutes. Therefore, to keep from burning out the motor switch number 2 is used. When the motor fails to start, the current flowing through the motor windings is very large. This large current makes the heater element in switch 2 red hot. The element heats the air around the bimetallic strip of switch number 2. The bimetallic strip bends up and the coil spring which is attached between the bimetallic strip and the switch arm, pulls the switch arm up thus opening switch 2 and stops the flow of current to the motor. In approximately two minutes the bimetal cools and bends back into its original shape and switch number 2 closes. This cycle will continue until the motor is able to start.

Service on the Electrical System

Every service engineer who works on Frigidaire sealed units should have a test cord. This test cord can be made up in a short time by using the diagram shown in Fig. 8. The test cord is used to prove that the relay is defective.

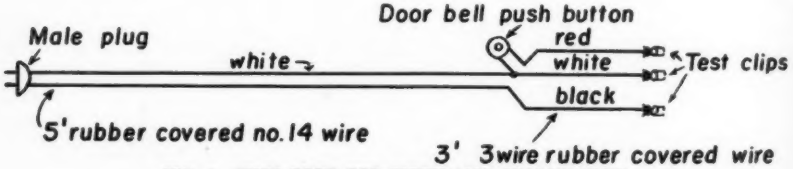


FIG. 8. TEST CORD FOR FRIGIDAIRE SEALED UNIT

If the unit won't start and the box is warm, the trouble may lie in the thermostat switch, the unit, or the relay. An examination of the thermostat will show whether or not the switch contacts are closed. If they are closed, the trouble must be in the relay or in the unit (it is, of course, assumed that the service man has tested the power supply to see that the machine is getting power).

Remove all food from the box and lay the box on its back so that you can get at the relay which is mounted near the motor. Remove the three motor leads at the motor and in their place, install the test cord. Plug in the test cord and press the button on the test cord. If the motor starts, release the button after about 2 seconds. If the motor continues to run, the trouble is in the relay.

Reconnect the motor leads and plug in the motor lead. If there is no hum in the motor, the heater element in switch number 2 is burned out and the relay must be replaced. *Do not substitute a piece of wire for the heater.* If this is done, *the motor will burn out the first time the motor fails to start.*

If the unit hums but does not start, the trouble lies in either switch number 3 or 4. Switch 3 may have frozen contacts so that the switch cannot open. Cleaning the contacts will generally clear up the trouble.

If the trouble lies in switch 4, either the contacts are dirty so that the switch does not connect the starting winding or the switch arm is bent so the contacts do not close.

If the motor starts but the overload switch number 2 keeps stopping the motor, switch 4 is no doubt burned closed so that the motor keeps running on both the starting and running windings. When this happens, the points can generally be cleaned up.

Replacing Switch

Experience has proven that when a new switch is available, it is far cheaper and more satisfactory to both customer and service man to change the relay rather than attempt to repair the old one. An attempt at repairing the old one should be made only when a replacement relay is not available.

When replacing a relay, it is essential that the proper size relay be used. (All size relays are identical except for the resistance of the heater in overload switch 2.) The horsepower of the unit can be obtained from the serial name plate which is located on the top of the condenser. This will be given as .05 hp., .06 hp., .08 hp., or .14 hp. The relays are marked correspondingly.

If a .06 relay is put on a .05 unit, the unit will work all right until the power fails during a running cycle, or until sometime when the unit tries to start before the internal pressures are balanced. In this case, the overload switch will not kick out when the motor fails to start. The current passing through switch number 3 will keep switch 3

closed so that the starting winding will not receive any current because when switch 3 is closed the relay coil is short-circuited and switch 4 must be open. Hence, unless the customer pulls the plug and allows the unit to cool, the machine will not start and in several hours the running winding will burn out.

Servicing the Unit

The greatest number of troubles requiring the removal of the unit to the shop will be due to refrigerant leaks—particularly on the older units. To recharge the unit with a replacement gas such as "Herveen" it is advisable to remove it from the cabinet and proceed as follows:

The charging ports (Fig. 9) are located on top of the cabinet and are exposed to view after removing the cabinet top. The outer thread on the ports permits the use of one of the adaptors of a charging valve set, such as manufactured by some of the brass products manufacturing companies.

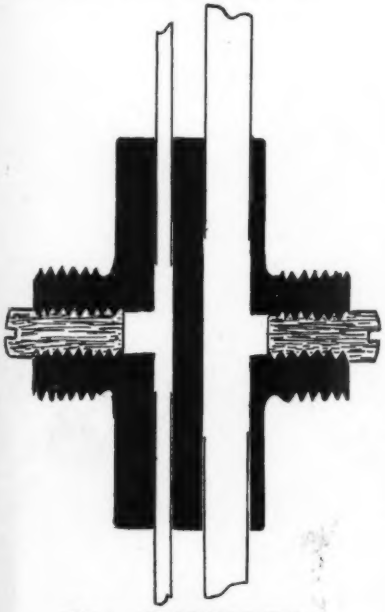


FIG. 9. CHARGING PORTS.

Where the plug in the charging port can be removed, the use of a charging valve adaptor provides the most convenient manner of charging. These plugs are soldered in place, however, and in many cases even when heat is applied they will resist any attempts to remove them. Under these circumstances, a ¼ inch hole can be drilled through the plug and a ¼ inch copper tube soldered in it, which can be used as a charging connection and pinched off and soldered when the job has been completed.

When connections have been completed, a test for leaks, using air, methyl chloride, or Freon pressure should be made. In those units employing an accumulator the most frequent leaks will be found at either end of the accumulator. Nearly all leaks may be repaired by soldering.

Drain the oil from the compressor dome by removing the plug (Figs. 1 & 10), fill the dome with carbon tetrachloride and allow the unit to run for not more than two minutes. Drain out the carbon tetrachloride; then connect a vacuum pump to the charging ports and pull as much vacuum as possible for a period of about one hour. During this period, heat should be applied to the re-

TABLE I—FRIGIDAIRE SEALED UNIT OIL & REFRIGERANT CHART.

Year	Model	Motor h. p.	Oz. Refrigerant	Oz. of Oil
1933	St-43	1/20	14	7
	St-67	1/20	16	7
1934	Koldchest	1/20	14	7
	R-4	1/20	14	7
	St-434	1/20	16	7
	St-534	1/16	18	7
	St-634	1/16	18	7
1935	St-435	1/16	17	7
	St-535	1/12	20	7
	St-635	1/12	20	7
	D3-35	1/20	14	7
	Koldchest	1/20	11	7
1936	Koldchest	1/16	14	7
	D3-36	1/16	15	7
	DRS5-36	1/12	19	7
	DRS6-36	1/12	19	7
	M4-36	1/16	18	7
	M5-36	1/12	19	7
	M6-36	1/12	19	7
	M7-36	1/7	23	7
	S4-36	1/16	18	7
	S5-36	1/12	19	7
	S6-36	1/12	19	7
	S7-36	1/7	23	10
	S9-36	1/7	26	10
1937	DRS5-37	1/12		10
	DRS6-37	1/12		10
	DRS7-37	1/11		10
	Mas-4-37	1/12		10
	Mas-5-37	1/12		10
	Mas-6-37	1/11		10
	Mas-7-37	1/7		10
	Mas-8-37	1/7		10
	Del-5-37	1/12		10
	Del-6-37	1/11		10
	Del-7-37	1/7		10
	Del-8-37	1/7		10
	D3-37	1/12		10

Use 300 Viscosity oil.
Refrigerant Amounts Shown Are for F114.

strictor, evaporator and condenser so that any deposits of oil and refrigerant at these points will be removed.

After the cleaning is completed, oil may be charged in by turning the unit upside down, removing the drain plug and pouring in the proper quantity of oil as shown in Table 1, using a good grade of 300 viscosity oil. In doing this the vacuum, of course, will be lost and it is, therefore, necessary to again connect a vacuum pump to evacuate the system before charging with refrigerant.

The unit should be checked for efficiency before charging with refrigerant. This may be done with methyl, Freon, or dried air pressure. A good unit should pull 25 inches of vacuum against a 40 lb. head pressure. A vacuum of at least 28 inches should be pulled on the entire system before charging.

The efficient operation of the unit will depend largely on your ability to remove all of the air, thereby keeping the head pressure down to a minimum. Refrigerant can be charged in both high and low sides in the liquid state while the motor is idle.

Table 1 will serve as a guide for the amount of refrigerant required in each unit. It must be remembered, however, that the amounts shown in this table are for F-114, and due to the difference in specific gravity in the two gases, the amounts for "Herveen" will be 5 oz. less than shown in the table.

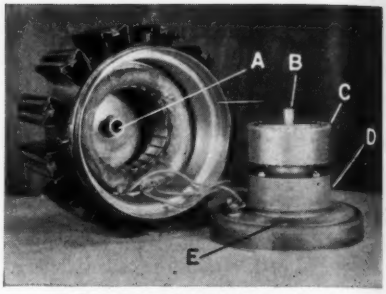


FIG. 10. COMPRESSOR OPEN.
A—Motor shaft socket.
B—Shaft and discharge tube.
C—Motor rotor.
D—Compressor.
E—Oil drain.

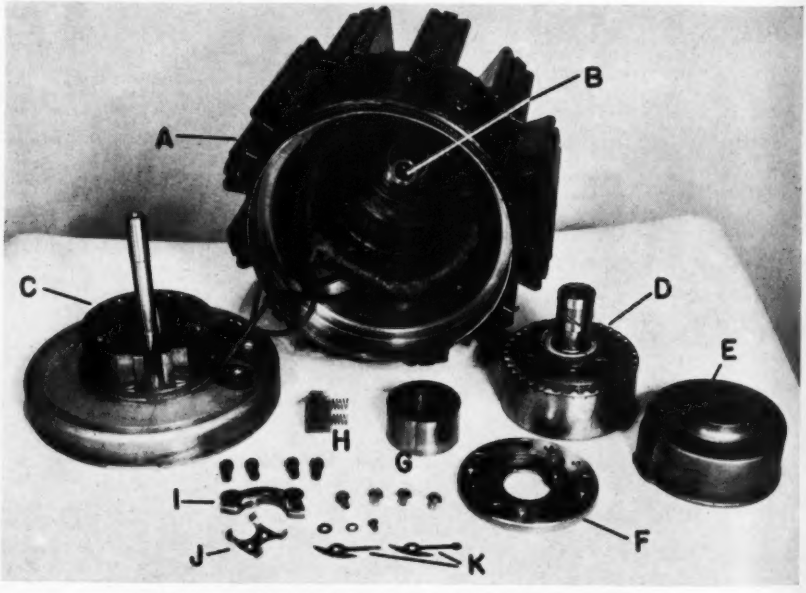


FIG. 11. COMPRESSOR PARTS READY FOR ASSEMBLY.
A—Compressor dome with stator winding.
B—Upper shaft socket.
C—Dome base and compressor cylinder.
D—Motor rotor and compressor eccentric.
E—Cylinder cover.
F—Valve plate.
G—Compressor impeller.
H—Divider block and springs.
I—Discharge valve cage.
J—Divider block spring retainer.
K—Discharge valve and retainer.

The unit will have to run for about an hour before refrigeration will show. If frost appears on the suction line during operation, it indicates an overcharge of refrigerant and a small amount should be purged from the highside of the system until the frost disappears.

During the first hour of operation the head pressure is likely to be more than normal due to the high back pressure. After the evaporator is frosted, however, the head pressure should drop to a normal of about 23 lbs. in a 70 degree room.

Opening Compressor Dome

Troubles which will require opening the compressor dome include burned out or shorted motors, broken or leaky discharge valves, and stuck compressor rotors.

A discharge valve that leaks slightly will seldom cause any noticeable difference in operation. Therefore, when it becomes necessary to open the unit to correct this trouble, the discharge valve will usually be found broken or held off its seat by particles of dirt.

Occasionally the valve will break, and due to its location part of it may fall into the compressor and become lodged between the rotor and cylinder, causing the compressor to stick at one point or stop entirely. When this happens it is advisable to thoroughly check the compressor shaft, cylinder block and rotor for proper alignment and smooth running before the compressor is closed up again.

The size of the wire used in rewinding the motor will, of course, be governed by the horsepower of the motor, and the general procedure will be the same as in any hermetic type of motor. Only delinted cotton covered wire should be used and every precaution should be taken to prevent ruffling of the cotton and eventual clogging of the screens due to lint which has washed away from the windings.

It is very seldom that any trouble will be found due to clogged screens, but if the occasion should arise to clean them, it can usually be done by blowing through with air pressure or replacing the screens with a standard type replacement. Screens are located at the suction inlet to the compressor, the outlet from the receiver, the restrictor, and in the accumulator on those units employing an accumulator.

To open the unit, the dome may be mounted in the lathe and the weld at (G) in Fig. 1 cut away, or if no lathe is available the weld may be easily ground away. The unit will come out as illustrated in Fig. 10 and the parts may be disassembled as in Fig. 11.

In reassembling the compressor extreme care must be used in keeping all parts clean and free from any loose particles which at some later date may clog the screens or the restrictor. Because of the low pressure employed in the unit, it may be sealed after repairs by brazing rather than welding if desired. Any pin holes in the brazing can be soldered by using a 95/5 solder.

TESTING THERMOMETERS

NO doubt you are occasionally bothered with the idea that your pocket service thermometer is not accurate and then you begin wondering how to test it. To test alongside another thermometer is not satisfactory, because you have no assurance that it is correct.

The simplest manner of testing is to place it under your tongue and hold it there about five minutes. If the temperature reads 98.6° F., which is the normal temperature of the body, you can be sure your thermometer is accurate.

A second method is to insert the thermometer in a container filled with cracked ice and sufficient water to cover the ice. If the temperature reading is 32° F., your thermometer is accurate.

CONVENIENT APPLICATORS

OCCASIONALLY you have need for a small hair brush to use as an applicator for soldering paste, cement, glue, etc. Applicators of this kind cost only a few cents, but the immediate need is seldom worth the time it requires to go and buy one.

Making one takes only a few minutes. Take a few hairs from any hair broom, or old paint brush, and insert them in the end of a short piece of ¼ inch copper tubing. Ream the burrs out of the end of the tubing first so they do not cut the hairs; then squeeze the end of the tubing shut in a vise, gripping the hairs inside the tubing. Trim the uneven ends of the hairs with a pair of scissors and your applicator is complete.

Thomas Booth
California

Enclosed you will find $2.00 to renew my subscription to THE REFRIGERATION SERVICE ENGINEER, which I am grateful to have.

Third Article

Simplified Air Conditioning

By GEO. G. BORDEN

BEFORE we can understand how to design and service air conditioning installations, it is necessary that we know the meaning of various terms used in the air conditioning business.

Cooling

Cooling is the process of removing heat. When we remove heat from air, the air becomes cold. On the other hand when we add heat to air, it becomes warm.

Temperature

Temperature is a measure of the intensity of heat—that is temperature tells us how hot or how cold air is.

Heat always flows in one direction only, from a higher temperature substance to a lower temperature substance. The rate of flow depends on two factors. First, the temperature difference between the substances, the greater the temperature difference the faster heat will flow from one substance to the other. Second, the heat resistance or as it is more commonly known, the insulation between substances. The better the insulation, the more slowly will heat flow from one object to the other.

Although temperature tells how hot or how cold an object is, it does not tell how much heat an object contains.

Heat Units

Heat units tell us how much heat an object contains, but they do not tell anything about the temperature of the object. For instance, one substance might be hotter than another but still the colder substance might contain much more heat than the warmer substance. As an example, of this, consider a glassful of water at 180 degrees and a pail of water at 80 degrees. The pail of water will contain many more heat units than will the glass of water even though the temperature of the water in the glass is 100 degrees F. higher than that in the pail. To make this clear, let's learn what is meant by the unit of heat content.

The unit of heat content is the B.t.u. (British thermal unit). A B.t.u. is the amount of heat required to raise the temperature of one pound of water 1 degree F. This means that if we placed a pan containing one pound of water at 60 degrees on a hot stove, heat would flow into the water from the hot stove. And this heat would gradually cause the water temperature to rise. If we removed the pan from the stove when the water temperature reached 61 degrees we would have added one B.t.u. to the water. If we allowed the pan to remain on the stove until the temperature rose to 70 degrees, we would have added ten B.t.u. to the water.

We know that at temperatures below 32 degrees F., water freezes into ice. Hence, we can say that a pound of water at 32 degrees contains no heat and as we raise the temperature of this water above 32 degrees, the heat content of the water increases. For every degree rise in temperature, the heat content of a pound of water will increase by one B.t.u. Thus, if we have one pound of water at 80 degrees, the heat of the liquid will be $80 - 32 = 48$ B.t.u. Now, if we assume that the glass holds a $\frac{1}{4}$ of a pound of water and this water is at 180 degrees, the heat of the liquid will be $(180 - 32) \times \frac{1}{4} = 37$ B.t.u. Thus, we see that although the water in the glass is at a higher temperature than that in the pail, it contains less heat than the water in the pail.

The heat picked up by an air conditioning system is usually classified as follows:

1. Sensible Heat
2. Latent Heat
3. Total Heat

When we are dealing with the cooling coil section of our air conditioning equipment we will be primarily interested in sensible and latent heat. On the other hand when we are dealing with the compressor end of our unit we are interested only in the total heat it has to pick up.

Sensible heat is the kind of heat that causes a change in temperature. For instance, if we place a pan of water on a hot stove, heat flows into the water and the temperature of the water rises. This heat is known as sensible heat.

If we place a pan containing one pound of water at 80 degrees on a hot stove, the temperature of the water will gradually rise until the temperature reaches 212 degrees F. When this happens, the temperature of the water will remain 212 degrees no matter how hot we make the stove. Now if the stove is at 1500 degrees F. and the water is at 212 degrees F., we know that heat must be flowing into the water because heat always flows from a hot object to a cold one. What is becoming of this heat that is entering the water?

It is changing the liquid water into water vapor called steam, and as this water vapor leaves the water it carries the heat away with it. In other words, as much heat is leaving the water in the form of steam as is entering the water from the stove, and for that reason the temperature of the water remains constant at 212 degrees F.

Latent Heat Defined

This heat that goes to change the water from a liquid into a steam is called latent heat or to state it another way, *latent heat is the kind of heat that changes the state of a substance.* The latent heat of steam, or the amount of heat required to change one pound of water to one pound of steam at 212 degrees F. is 970 B.t.u.

Suppose we place a pan containing one pound of water on an evaporator of a refrigerator that is held at 0 degrees. Heat will flow from the warmer water into the colder evaporator and as a result the water will get colder. Hence, the kind of heat that we are removing from the water is sensible heat because it is causing a change in temperature. The water temperature will keep dropping until it reaches 32 degrees F. Then for a long period of time the temperature will remain constant.

If the water is at 32 degrees F. and the coil is at 0 degrees F., heat must be flowing out of the water into the evaporator, but why doesn't the temperature change? It doesn't change because the water is giving up *latent heat* to the coil and the water is *changing its state from a liquid into a solid called ice.* When 144 B.t.u. have been removed from the water, the water will no longer be a liquid. It will now be a solid cake of ice one pound in weight. Hence we say that the latent heat of ice is 144 B.t.u. per pound.

If we continue to remove heat from the ice, the temperature of the ice will fall until the ice temperature becomes the same as the coil temperature.

Latent Heat of Evaporation

If we place an open pan of water in a room, after a period of time, the water will disappear and the pan will be empty.

We know that it has been absorbed by the air in the room, but before it could be absorbed it had to be changed from a liquid into a vapor, and we know that in order to change the state of a substance such as water that latent heat must be added to that substance. The water picked up heat from the surrounding air and caused the water to change into a vapor. *Of course, the temperature of the water was not raised to its boiling point.* This change of state took place at room temperature and is called evaporation. In order to evaporate one pound of water 1,050 B.t.u. are required. Likewise when we remove one pound of water from the air, our machine has to pick up 1,050 B.t.u. More will be said about evaporation later.

In air conditioning work our cooling coil has to pick up both sensible and latent heat from the air. By picking up sensible heat the air is made cool and by picking up latent heat the air is made dry. *The sum of latent and sensible heat is called total heat.*

Humidity

Humidity is water vapor in the air. When there is a lot of moisture in the air we say that the atmosphere is very humid. The amount of moisture that air can hold is determined by its temperature. The higher the temperatures, the more moisture air can hold.

As an example of how the amount of moisture air can hold in relation to the air temperature consider Table 1. From this table we see that 100 cubic feet of air at 40 degrees can hold only .65 ounces of moisture whereas 100 cubic feet of air at 80 degrees can hold 2.5 ounces or almost four times as much.

Air seldom contains all the moisture it will hold or is seldom fully saturated. Fully saturated air shows up as a fog. In order to determine the percentage of saturation

TABLE I.

Temperature of 100 cu. ft. of air	Ounces of Moisture in 100 cu. ft. of air
40°	.65
50°	.94
60°	1.20
70°	1.86
80°	2.50
90°	3.40
100°	4.56

we use a term known as relative humidity which may be defined as the ratio of the actual weight of moisture in the air, divided by the amount of moisture the air could hold at that temperature.

As an example of relative humidity, let us suppose that we have 100 cubic feet of air at 100 degrees F. that holds 1.5 ounces of moisture. What is this relative humidity?

$$\text{Relative Humidity} = \frac{1.5}{4.56} = 32.8 \text{ percent}$$

If this 100 cubic feet held three ounces of moisture, its relative humidity would be

$$\text{R.H.} = \frac{3}{4.56} = 65.5 \text{ percent}$$

Dew Point Temperature

Dew point temperature is the temperature at which air becomes one hundred percent saturated. For instance, if we had 100 cubic feet of 80 degrees air that held 1.3 ounces of moisture, the dew point temperature of this air would be 60 degrees. That is, if we removed heat from this 80 degrees air, its ability to hold moisture would gradually decrease. At 70 degrees the maximum amount of moisture the air could hold would be 1.86 oz.

Finally when the temperature reached 60 degrees, the air would be fully saturated with moisture because at 60 degrees, 100 cu. ft. of air can hold 1.3 oz. of moisture. If we tried to drop the air below 60 degrees, the air would not be able to hold 1.3 ounces of moisture, and, as a result, moisture would condense out of the air. Hence, in cooling, it is necessary that we always drop the temperature of the air below the dew point in order to remove moisture from the air.

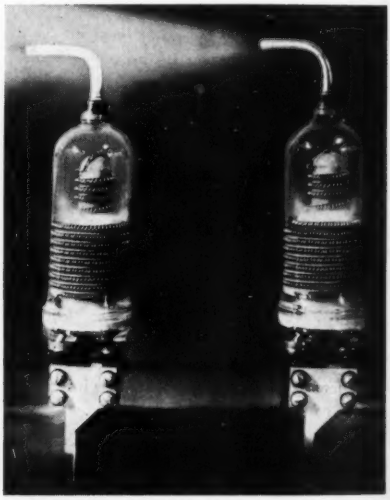
As an every day example of dew point temperature, we can take the case of a glass of cold water on a warm day. We know that on a warm day, the outside surface of this glass would be covered with moisture. This moisture was water taken from the air because the glass is at a temperature below the dew point temperature of the air.

* * *

NEW STEAM GENERATOR TUBE

A POWERFUL steam generator no larger than an incandescent lamp, and similar in appearance, has just been announced by the Westinghouse Lamp Division, Westinghouse Electric & Manufacturing Company, Bloomfield, N. J.

With a thermal efficiency of 90 percent because the heating coils are directly immersed in water, this flash type of heater can generate superheated steam from cold water in less than fifteen seconds. It is made in 1,000, 1,500 and 2,000 watt sizes, with evaporating capacities up to 5.7 pounds of water per hour, and can superheat steam to 350 degrees Fahrenheit.



Hot steam blows from these midget electric boilers after fifteen seconds of operation. Newest development of Westinghouse research engineers, this pocket-edition steam plant operating on the ordinary electric circuit, can be turned to thousands of uses in homes, restaurants, doctors' and dentists' offices and industrial plants in which small amounts of hot steam are needed in a hurry. Super-heated to 350 degrees Fahrenheit, steam produced by the generator can be used for sterilizing or processing.

The cylindrical case of the diminutive steam boiler, 9¼ inches long over all, is made of transparent glass, capable of withstanding an internal pressure of 25 pounds

(Continued on page 69)

Servicing Ice Cream Cabinets

By EVERETT J. NEWCOMER*

ICE cream cabinet service, contrary to the belief of some service engineers, is in reality a very simple application of common sense and refrigeration knowledge. Nowhere in the refrigeration business is the necessity for sound reasoning more important than in this branch of the industry.

Before any service engineer should attempt to service this type of equipment, he should have a thorough understanding of the functions of refrigerants, and oils, at the low temperatures encountered in dispensing and hardening cabinets; and particularly should he know and follow the precautionary measures necessary.

The total disregard of these important factors will surely lead to a great many costly errors, which will of course be reflected in the amount of business derived from this type of work.

In performing service operations on ice cream cabinets, and particularly those used for hardening, the most important thing to avoid is allowing moisture to enter the system. Never under any circumstances should a line be left open that is sweating or frosting, as to do so will allow moisture condensation in the line and plenty of trouble will result for the serviceman. A small amount of refrigerant bleeding through all lines while they are being disconnected is a very good insurance policy against the entrance of moisture, and the small amount of refrigerant lost will pale into insignificance compared to the cost of drying a wet system.

In duplex systems where a hardener and dispensing cabinet are operated from the same condensing unit, the usual practice is to install a check valve in the suction line of the lower temperature fixture, in this case the hardener. The purpose of this check is to prevent the entrance into the hardener coil of the superheated vapor from the dispensing cabinet while it is flowing into the common suction line. Particular care must be taken not to disregard the presence of this check when pumping down such a system, because with a check holding tightly a true low side gauge reading will not be possible unless the pressure in the hardener coil is great enough to overcome the resistance of the check. It then follows that to be certain a pressure is present in the hardener coil its temperature must be raised to at least plus 10 degrees Fahrenheit using methyl chloride or Freon and warming to room temperature is advisable.

Service engineers have been called to service ice cream cabinets, and after a thorough diagnosis, a moisture condition is indicated, even though the equipment has been operating perfectly for some months past. Furthermore no air is found in the system and no low side leaks are apparent. Such a set-up of conditions is baffling although not at all uncommon.

Undoubtedly a condition of this kind could be traced back to some previous service operation, wherein the service engineer had been careless in not having his coil temperature high enough to prevent condensation of moisture contained in the air from entering the cold coil. This moisture then froze to the walls of the coil and remained there until such time as the coil was allowed to warm up enough to melt the ice formation, or it may have been dislodged by a refrigerant slug. In either case the circulation in the system would lodge it in the expansion valve and a freeze-up would result.

Charging chemicals into a refrigerating mechanism to relieve a bad case of moisture is highly objectionable. In the first place this will in no way dry the system and this moisture must be removed for the continued trouble-free operation of the machine; and secondly the known corrosive effects of these chemicals will in a short time cause a more serious service problem.

Dryers charged with a proven drying agent will do a lot of good if installed in the liquid lines of each expansion valve, and would be more efficient if used in the suction lines as vapor dryers. However, drying in

*Mills Novelty Co., Chicago. Paper delivered before the fifth annual R.S.E.S. Convention—Buffalo, N. Y.

the liquid phase is recommended, as in the majority of cases in ice cream service, the valves will freeze up before the vapor dryers have had a chance to complete their work. This method of drying is satisfactory where a small amount of moisture is present but when large concentrations are encountered the labor cost of call-backs to thaw out valves and change dryers makes it impractical.

The recommended procedure with very wet systems is: Remove all the refrigerant and oil from the system and warm the coils and lines to room temperature. The compressor, receiver, and expansion valves should be removed and thoroughly washed out with carbon tetrachloride. All lines and the coils should be blown out with dry CO_2.

After the machine has been assembled and the oil charge replenished a pressure of at least 30 pounds should be built up and the system checked for leaks. When all leaks have been repaired a new gas charge should then be added. Placing a dryer in the liquid line at the receiver is recommended to catch any small traces of moisture which may have been left but be sure and remove this dryer as soon as possible and certainly within one month.

Check the Seal

Make a habit of running your hand under the seal hub of all compressors on routine service calls and many times a seal leak will be shown long before it actually leaks gas. An oil slick at this point shows a slight leak is present and quick repairing will save many hours later.

Service engineers are sometimes confronted with the possibility of moisture, a partially plugged coil, or a sticking expansion valve causing the trouble and not knowing exactly which. A comparatively simple method of testing for all three conditions has been found, and all the equipment necessary for these tests is an ordinary hand valve, two gauges, and a few fittings.

In making up this test unit a compound gauge is placed in a line leading from one side of the hand valve, and a pressure gauge is connected in a line leading from the other side of the valve. This unit is then connected in place of the expansion valve by connecting the liquid line to the line wherein the pressure gauge is connected and connecting the coil to the line with the compound gauge. The hand valve should be cracked slightly and operated as a manually operated expansion valve. If moisture is causing the trouble the valve will freeze up just as the expansion valve would do and the difference in readings between the compound gauge at the valve and at the compressor will be only slight.

A partially plugged coil will make itself known when the reading of the compound gauge at the compressor is extremely low and the reading at the valve comparatively high. The system will function satisfactorily with this hook-up if the trouble is a sticking expansion valve.

While the pressure gauge is not at all necessary for these tests it will afford an opportunity of checking the pressure drop of the liquid line and any restriction will be readily noticed.

T.X. Valves Widely Used

Thermostatic expansion valves are widely used in ice cream cabinets, and in the vast majority of cases are correctly set at the factory before shipment. No adjustments should be made unless the service engineer is thoroughly familiar with the methods of testing and setting these valves for their correct superheat. These tests are, however, easily made in the field, and the equipment required is usually found in the average service engineer's shop making it unnecessary to purchase additional tools. Most valve manufacturers will be glad to furnish information regarding the equipment necessary and the methods used in adjusting, as well as information regarding superheat settings for most applications. Thousands of valves are returned to factories each year as defective, and after an examination the only defect found is incorrect adjustment. This practice is expensive for both the service engineer and the factories, and should be eliminated as much as possible. Thermostatic expansion valves set to operate at 10 degrees superheat will be found most satisfactory for ice cream dispensing and hardening cabinets.

Recently a dispensing and hardening cabinet combined, so arranged that it can be instantly changed from one to the other, was introduced to the industry. Its operation differs greatly from the conventional types of cabinets we have been servicing in the past. The cabinet is divided into separately insulated compartments of 20 gallons each. No holdover solution is used nor does the coil touch the cabinet linings; instead a sin-

gle, bare-copper, continuous-tube coil extends the full length of the cabinet and is placed in a special chamber on one side. Each compartment is baffled with the return air duct to the coil chamber at the top and blower outlets at the bottom. Forced air circulation is maintained by a series of blowers on a line shaft, driven by a small motor. Adjustable shutters are provided for the blower outlets in order that the operator may control the air circulation and consequently the amount of refrigeration in each compartment, thereby maintaining different temperatures if desired. Partial insulation of the coil is affected at the point it enters each compartment in order to minimize the circulation of air between compartments. Zone-marked thermometers are provided on the front panel giving an instant reading of temperatures in each compartment.

A thermostatic expansion valve is used with a solenoid connected in the liquid line just ahead of the valve. Both the solenoid and the motor driving the blowers are operated by a thermostat. Cabinet dispensing temperatures are controlled by placing the feeler bulb of the thermostat in one compartment and using this as the control compartment. For example: If we had a cabinet with three compartments, and three different dispensing temperatures were desired, it would only be necessary to set the thermostat at the lowest desired temperature required for the control compartment, and throttle the blower outlets of the remaining compartments as needed, to maintain the temperature desired.

When the cabinet is used as a hardener the thermostat is shorted out by a time switch which is set manually for the number of hours hardening necessary. This keeps the condensing unit in operation continuously during the hardening operation. When the time switch trips off at the end of the hardening period the thermostat is again cut into the circuit and due to the low temperature of the control compartment the machine will remain idle until the control compartment warms up to the cut-in point as set on the thermostat. Hardening with automatic return to dispensing is thus accomplished.

Defrosting

Defrosting should be done about once each week depending upon conditions. One compartment may be defrosted at a time or all may be defrosted at once if desired. A toggle switch on the control panel marked "Normal" and "Defrost' is placed in the Defrost position which opens the solenoid circuit without stopping the blower motor and the lids are then removed allowing room air to be drawn over the coil. The accumulated frost then melts and is removed as water with a sponge. After wiping dry the Defrost toggle switch is returned to the Normal position and the cabinet is pulled down to temperature.

Thermostatic Water Valve

The thermostatic water valve is a piece of equipment comparatively new to the refrigeration industry and should come in for some discussion. This valve differs in several ways from the conventional pressure operated valve. In the first place, the valve is controlled by outlet water temperature rather than by head or receiver pressure. The feeler bulb is about 13 inches long and all of it must be inserted into the condenser proper, or in other words, it must be far enough in the condenser to be beyond the junction of the hot gas from the head, and the condenser water outlet. I am speaking of course of a condenser using counterflow water circulation. Wide variations of water pressure do not seem to affect its operation, and absence of chattering and pounding is quite apparent. The bellows case must be kept at a temperature always above that of the feeler bulb, or condensation of the charge in the bellows will take place, and render the valve inoperative. Clamping the bellows case into a recess of the discharge manifold has proven an effective method of eliminating this condensation.

Valve Settings

Sluggish operation of the valve is usually caused by having only part of the feeler bulb inserted in the condenser and this might also cause short-cycling from the high pressure cut-off, if the valve does not open quickly enough after the compressor starts to keep the head at a normal pressure. Air in the system will cause the valve to open and close quickly but will not prevent its closing.

Its setting is obtained by placing a thermometer in the discharge water stream and maintaining an outlet temperature of approximately 95 to 100 degrees. The cut-off point will be about three degrees lower than the operating temperature.

SERVICE KINKS

Tools and Equipment You Can Build

Under this heading will appear simplified or short cut methods of performing individual service operations; also details of how you can build special tools and equipment for your own use. Readers are invited to submit information for publication under this head.

The following first three kinks were the winners in the third prize class in the contest conducted by THE REFRIGERATION SERVICE ENGINEER the latter part of 1938.

A Recording Pressure Gauge

By DONALD HUNT

HAVE you ever wanted to know just how often and how long a refrigerating unit was running? An off and on recorder is the answer, but the instruments now on the market cost more than the average small independent shop is able to invest.

I solved the problem by building a recording compound gauge.

My principal use of the recorder is to check two strings of ice cream cabinets—one group using automatic expansion valves and thermostat switches, the other low side floats and pressure controls. I find that on the expansion valve jobs, the recorder tells something of the condition of the valves.

A leaking valve is indicated by the pressure continuing to climb after reaching the pressure where the valve should close tight, and the rate of climb indicates how bad the leak is.

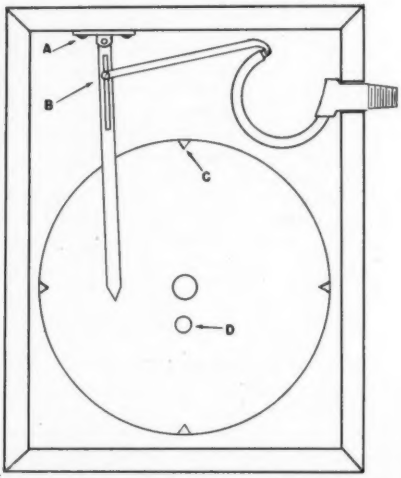


FIG. 1. A RECORDING COMPOUND GAUGE.

A—Slide for Zero Set.
B—Slide for Adjusting Arc of Pen.
C—Tabs for Holding Edges of Paper.
D—Nut to Hold Center of Paper.

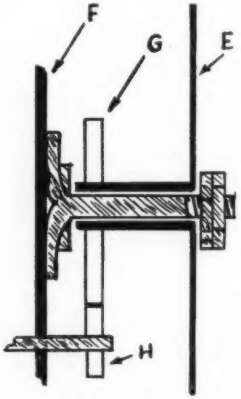


FIG. 2. THE ADDITIONAL SHAFT SOLDERED TO THE CLOCK FRAME.

E—Metal Disc for Holding Chart.
F—Clock Frame.
G—Hand-cut Gear with Twice the Number of Teeth as in (H).
H—Hour Hand Gear and Shaft.

A valve that is sticking is indicated by the pressure falling too far when the compressor starts, and raising sharply to normal when the valve breaks loose.

From these charts, trouble can be foretold, and the cabinet watched by the man making ice cream deliveries.

The advantage of shooting trouble this way is that the check can be made by an assistant. The cabinet is apparently okay and the check is just to catch trouble before it gets serious.

In checking a cabinet, it is run until its normal temperature is reached (usually overnight). Then the compressor valves are checked by pumping high head pressure into the high pressure gauge. The condition of the piston valve is shown by the maximum pressure that the compressor is able to pump when both valves are in good condition. The pressure cannot be measured on the regular service gauges. When the compressor valves are found to be okay, the recorder is attached to the low side service connection and left for 24 hours.

I tried to design a recorder that was both low in cost and easy to build. The record sheet is driven by a dollar alarm clock and the pressure element was taken from an old compound gauge. The works are mounted in a small wooden box with the pressure element and pen fastened to the inside of the deep cover in such a way that when the cover is closed, the pen rests in the proper place on the paper record sheet. The disc which supports the sheet is mounted on a shaft soldered to the clock works, and is driven by a hand cut gear so that the disc turns once in 24 hours.

S S S

Combination Wrench

By FRANK DEPAGNIER

FINDING that every time I had to open or shut a valve on a machine, I had to take off a valve cap or loosen a packing nut, I generally had an adjustable wrench

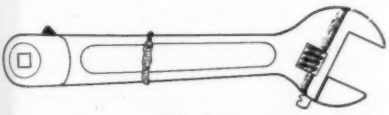


FIG. 1.

for this purpose. After taking off the cap, I would use a ratchet wrench. This would happen many times in a day, so in order to eliminate a lot of waste motion, I devised the tool shown in Fig. 1.

I cut my ratchet wrench in the center with a hacksaw. I did likewise with my adjustable wrench. I then had them welded together for a few cents, resulting in a very convenient tool to use.

S S S

Refrigerant Leak Detector

By ELMER HUNYADY

ELMER HUNYADY

YOU do know that the various methods we now have for refrigerant leak detection are not 100 percent certain or foolproof in the case of small or very minute leakage.

But, escaping gas, no matter how small the leak, is always accompanied by a hissing sound, sometimes too faint for the human ear to catch. So, following this fact, I have procured for myself a stethoscope, such as used by doctors. With this instrument, I can locate any leak, however small.

This stethoscope has become indispensable —the best tool in my service equipment— and has saved me and my customers many dollars of refrigerant loss. Also, its use lends a certain air of assurance and dignity to the whole proceeding, absolutely satisfying the owner of the equipment that the leak has been detected, and when the necessary repairs are made, the collection for the job is much less painful to him.

S S S

TO REMOVE RUST FROM METALS

TO remove rust from metals, Dr. C. F. Mason, in "Chemical Industries," recommends the following glycerine-containing preparation. The preparation is a paste and is particularly suited for use in inaccessible engraved surfaces. It is composed of:

Oxalic acid	20
Phosphoric acid	20
Glycerine	10
Ground silica	50

The paste is applied to the rusted area, and after being allowed to stand in a warm place for fifteen to twenty minutes, is then washed off.

Refrigeration in a Chicago Bakery

THE three Dressel brothers, William, Joseph, and Herman, recently opened the fourth store in their chain of bakeries in Chicago. This is probably one of the newest and finest bakeries in the middle west, and is located at 1237 W. 79th Street, Chicago. The Dressels started their bakery business 25 years ago with a single bake shop. They are said to be the originators of the whipped-cream cake and to have brought it to its tremendous popularity.

Week-ends the Dressel bakery turns out 15,000 to 18,000 whipped cream cakes. On holidays the count runs up to 20,000 and 25,000.

Because whip cream is such a perishable product, the handling and storing of these

Interior of Dressel's new shop at 79th St., Chicago.

cakes involve a special refrigeration problem. In the 79th Street store is a special cake-holding room, 21'x23'x9', capable of storing 3,500 whipped-cream cakes at one time. A 5 h.p. Mills compressor in the basement and Rempe coils in the storage room insure proper, dependable refrigeration at all times.

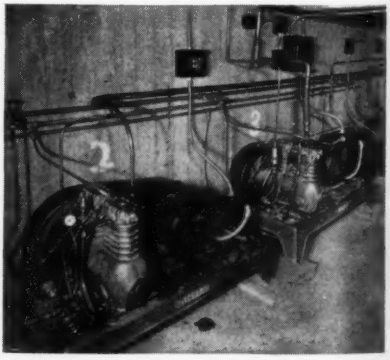
In addition to the 5 h.p. job, there are five other Mills compressors, each performing a specific function and each independent of the rest. A 7½ h.p. Mills handles the store's air conditioning system. A ½ h.p. Mills takes care of a 12-foot refrigerated display case, and two ⅓ h.p. Mills condensing units handle an ice cream dispensing cabinet and a kitchen ice box. A 2 h.p. Mills is to be installed for a dough-retarding box and a storage cooler in the basement.

The shop has a special dough mixer imported from Switzerland resembling a huge

Refrigerator room for storing whipped cream cakes.

pair of hands, lifting, rolling, and kneading dough. A giant bake oven has a revolving ferris wheel big enough to ride on. A special room just for daily flour storage.

The entire refrigerating and air conditioning system is a model of modern efficient installation work and is the work of Chicago refrigeration experts. Walter C. Hilger was general contractor on the building and much credit is due this able refrigeration engineer for a splendid job well executed.



Six Mills compressors provide for all refrigerators and air conditioning systems.

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box."

Comments on Previous Questions

QUESTION BOX: Referring to Question 302; the Warren Co. Inc., 905 Fair Street, Atlanta, Georgia, manufacture display cases using a built-in hot gas defrosting system for single unit installations, and detailed information concerning the operation of this system could be obtained by addressing this company.

If the condensing unit connected to this case was supplied by the Warren Company, it originally was equipped with a 3-way valve between the compressor and the condenser, and a check valve between the condenser and the liquid receiver, the purpose of the check valve being to prevent liquid and saturated vapor leaving the receiver and entering the hot gas defrosting line and precluding the possibility of a back flow from the receiver to the evaporator.

The Warren Company have been using a hot gas defrost system for many years with a high degree of success.

Very truly yours,
K. M. Newcum,
Superior Valve & Fittings Co.

QUESTION BOX: I was very much interested in question number 304 which appeared in your May issue of the Refrigeration Service Engineer concerning repairs made on a Crosley Refrigerator.

The answer given relative to the equalization of the head pressure to the suction pressure is correct.

It was stated in the question that the machine cut out when the suction pressure reading was eight pounds and the head pressure reading sixty-five pounds at a room temperature of sixty-five degrees F. The head pressure is approximately correct, but the suction pressure reading is high for a correct thermostat setting. The temperature range on the thermostat for a normal setting should be from twelve degrees to twenty-seven degrees. This would give a suction pressure at the time of cutting out of from two to five inches vacuum.

I would suggest that the cutting in and cutting out points of the thermostat be checked against thermometer readings, in order to be sure that the refrigerator is operating correctly.

Very truly yours,
Don Markel,
Cincinnati, Ohio.

QUESTION BOX: In reference to Question 299; In the Norge models H & W the check valve is located on the compressor side of the suction service valve gauge port and the back pressure should not increase to any great extent when the Rollator is stopped down, providing the check valve is in good condition.

In practically all of the other Norge models, the check valve is located on evaporator side of the gauge opening and the back pressure will rise rapidly every time the Rollator is stopped. The Rollator employs a discharge valve which effectively prevents a back flow of refrigerant vapor through the discharge tube; however, since the oil contained in the Rollator dome is under full head pressure, and is forced into the Rollator proper by the difference in pressure, the vacuum is quickly lost on the low side of the Rollator and the pressure rapidly builds up to full head pressure. This action is normal and is the method used to insure adequate lubrication and to maintain the oil seal in the Rollator.

In reference to Question 302; I believe that the "hot gas" defrosting coil in the drain gutter of the display case under discussion, was intended to be connected to the liquid line, and that the outlet of this coil should

be connected to the expansion valve. When connected in this manner the warm liquid coming from the liquid receiver should maintain this portion of the drip pan in an ice free condition at all times. This method should work out very nicely since any heat introduced into the refrigerated space by the warm liquid line or its extended surface would be compensated for by increased efficiency and capacity in the evaporator. This increased efficiency would be a result of the sub-cooling of the liquid refrigerant a few degrees.

Yours very truly,
Edward N. Avery,
Dunmore, Pa.

QUESTION BOX: In regard to Question 299 in your April issue, the gentleman who asked for a solution to his problem on a Norge unit has no problem because every Norge does the same thing. The reason being that the gauge port for the suction line is placed before the check valve. When the compressor is stopped the gas and oil back out of the compressor up to the check valve. Therefore, any gauge in the suction port will show a high back pressure. In fact any gauge installed in a Norge suction line is liable to be damaged when unit is stopped if the gauge does not have a high scale.

K. N. Newcum, in his answer, says that the Norge compressor does not have a discharge valve. I have rebuilt many Norge compressors and they all use a discharge valve. They do not have a suction valve, a port cut into the compressor wall is used to admit gas to the rollator.

Yours truly,
John S. Mehalik,
Monessen, Pa.

ESTIMATING LOAD ON DISPLAY CASE

QUESTION 309. I have a meat market owner who has bought a second-hand display case—just the bare case, with no cooling coil or machine. He does not know what the refrigerant is, the i.m.e., or anything about it.

This case is steel, with three inches of corkboard insulation, and in good condition. It has:

164 sq. ft. outside surface.
12 sq. ft. triple glass on front side
12 sq. ft. double glass on rear side

My customer wants to keep it at 33 degrees. Highest ambient temperature 95 degrees, temperature differential 57 degrees ambient temperature. I have figured 5 degrees over average given for Chicago, 16 hours operating period. Here are my figures:

12 sq. ft. triple glass = 2.9x12 = ...	25.08 sq. ft.
12 sq. ft. double glass = 5.1x12 = ...	61.02 sq. ft.
	87. sq. ft.
Outside surface 164 sq. ft.....	164.
	251. sq. ft.

I have figured this case would need a machine with a capacity of approximately 90,000 B.t.u., or 625 i.m.e. I am figuring on using SO_2 or methyl chloride, with a Detroit automatic expansion valve.

Would you advise two cooling coils? Is there a chart or guide I could get, which would give me a short-cut on figuring refrigerator show cases, such as this one?

ANSWER: Referring to heat leakage factors, and applying these to the information you have given, we have the following information on which to base an estimate of the total heat leakage in your display case:

12 sq. ft. of triple glass with a conductivity of .281
12 sq. ft. of double glass with a conductivity of .45
164 sq. ft. additional surface 3" corkboard with a conductivity of .093
Temperature differential equals 95 — 38 = 57°

The conductivity factors given above indicate the B.t.u. leakage per square foot per hour per degree temperature difference between the outside and inside temperatures for the material mentioned; therefore, our total leakage will be as follows:

		B.t.u. per hour
Triple Glass	12 × .281 × 57 =	192
Double Glass	12 × .45 × 57 =	308
Walls	164 × .093 × 57 =	871
		1371

This represents the total actual leakage through the glass and walls of the showcase. To this amount, we shall have to add 25 percent as a service load, which will take care of the opening and closing of doors, and the insertion of meat loads; therefore, we have a total heat leakage of 1371 plus 343, which equals 1714 B.t.u. per hour.

Since our machine will be required to run only 16 hours per day, our machine will have to produce

$$\frac{24 \times 1714}{16} = 2570 \text{ B.t.u. per hour}$$

This is equivalent to a load produced by a ½-hp. machine.

Since you have not given me a sketch of this showcase, and I don't know whether it is of the back bunker type, or just what the layout is, it is difficult to specify what coils should be used. I would say, however, that if it is at all possible, a fin coil should be placed in the top of the case, which will carry the greater part of the load. If there is space beneath the pans, it may be advisable to place a bare pipe coil extending the full length of the case at this location.

You have stated that you are going to use a Detroit automatic expansion valve. I don't believe an automatic expansion valve would be suitable for this kind of work, and I would recommend that you use a thermostatic expansion valve instead.

HUMIDITY IN THE AVERAGE REFRIGERATOR

QUESTION 310. Will you please give the correct or ideal humidity for a retail walk-in box, and also for a double-duty display case, as it would be indicated with a humidity indicator in a 38 degrees F. average box?

Would you also be so kind as to tell me at what point, or below what point, humidity, or lack of it, begins to have a drying-out effect on the meat stored therein? It is our plan to purchase a humidity indicator and with information which we have requested from you, to know definitely on each installation where we stand on the humidity problem.

We would also appreciate any suggestion you may give in regard to better humidity conditions in small walk-in boxes of a size about 6 ft. x 6 ft. x 6 ft., using forced air coils. We have tried low-speed control, baffling of air leaving coil, made sure of a flooded coil condition, and have experimented with narrowing and widening cut-in and cut-out pressures, but we still get serious drying-out of products stored two days to a week.

ANSWER: Humidity indicators are usually read in percentage of moisture in the air, which means the relative amount of moisture found in the air in comparison to the moisture the air will hold at a given temperature.

In all refrigeration work where food is being stored, it is desirable to maintain as high a humidity as possible, which under the proper conditions, may be as high as 70 to 75 percent. Drying effects may be noticed when the humidity drops below 40 percent. However, it is not always the percent of humidity which causes this drying effect. Such things as velocity of air movement, direction of air movement, fluctuation in cabinet temperatures, coil size and temperature, will cause excessive drying.

The best results will be obtained when the coil is properly balanced with the size of storage space, and to secure this proper balance, I believe it is necessary to be governed by the manufacturer's specifications on his coil, because ratings will vary with the different makes.

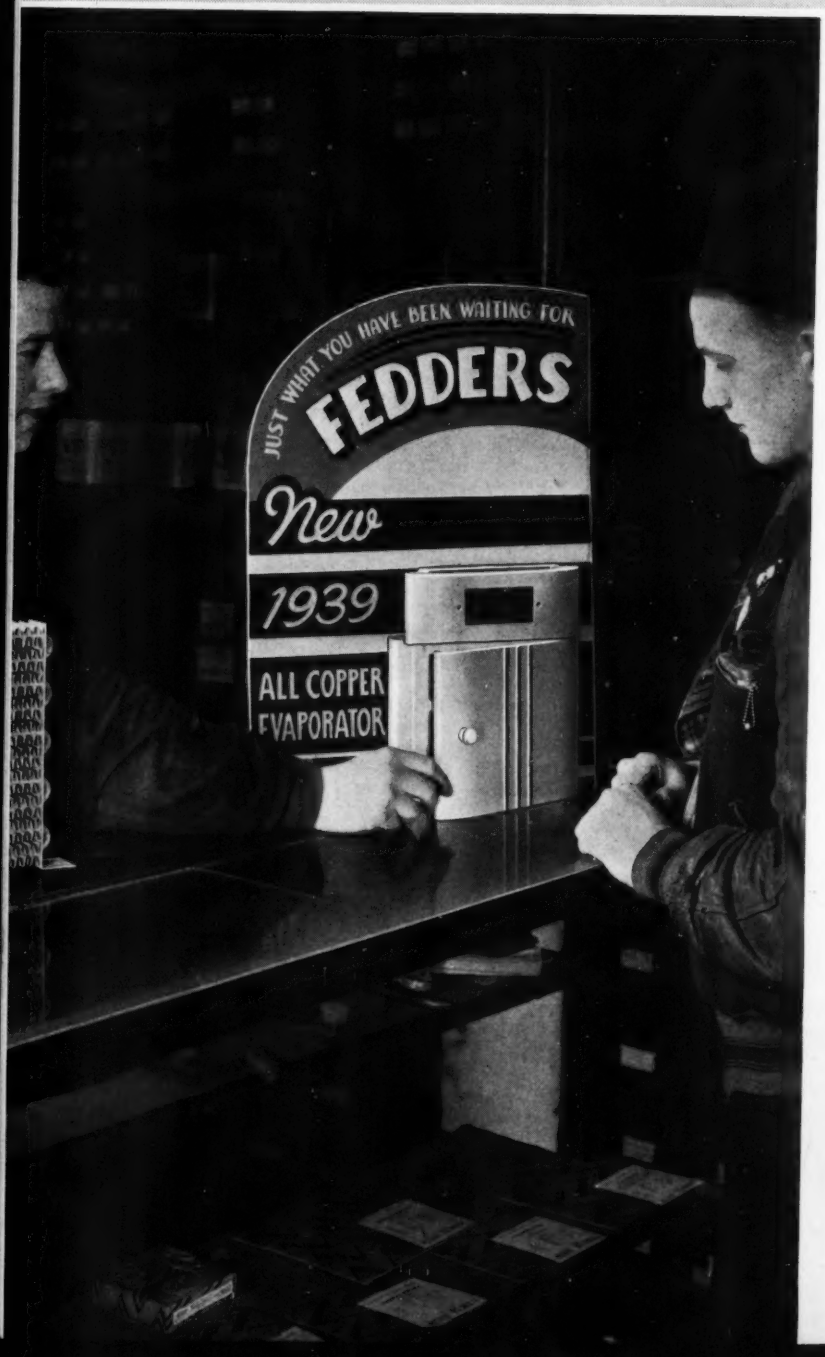
The temperature of the storage space should not be permitted to vary over 5 degrees, but at the same time, sufficient variation in coil temperature must be permitted so the coil will defrost on each cycle and also operate at a low enough temperature to cool the storage space to the designed temperature. This, of course, is governed considerably by the size of coil used. If the coil has not sufficient surface, too low refrigerant temperature will have to be maintained, and consequently, too much moisture will be condensed out of the air. It is desirable, therefore, to maintain the refrigerant and storage space temperatures as close together as possible.

Air Velocity Important

The velocity of air movement is perhaps the most important factor of all. If the velocity is too great, a drying effect will be noticed, and if the velocity is too low, a slimy condition of the meat may result; therefore, it is important to secure the proper rate of air movement for each cabinet.

An easy method of determining the proper velocity in a refrigerator is as follows: Take one-half of the refrigerator cross-section in square feet, and divide the c.f.m. of the unit cooler by this figure. The result will be the air flow in feet per minute. As an example of this, we will consider a refrigerator which is 9 ft. wide by 7 ft. high. The cross-section is, therefore, 7 x 9, or 63 square feet. One-half of the cross-section would be approximately 32 square feet. If the unit cooler is rated at 1800 c.f.m., the answer will be 1800 divided by 32, which will equal 56 feet air flow velocity.

LOOK FOR H



RE IG

19 H

• R eration
ne usehold
co ted fins
du and re

B for dry
mo hey ma

2 and 5 t
bra and st
use either

FE DERS

Atta B
Los
Export

THIS DISPLAY

At your

REFRIGERATION SUPPLIER'S

featuring

FEDDERS

19 HOUSEHOLD EVAPORATORS

• Refrigeration suppliers everywhere are stocking the complete line of Fedders new household Evaporators. Handsome design of front shield and door . . . corrugated fins . . . Fedders Silver-Satin finish make them ideal for production and replacement installations.

Ratings for dry expansion systems using all standard refrigerants except ammonia. They make a low side when equipped with Fedders expansion valves.

2, 4 and 5 tray models give the correct size for every job. Integral hanger brackets and standardized dimensions provide quick hook-up. They can be used for either top or bottom feed.

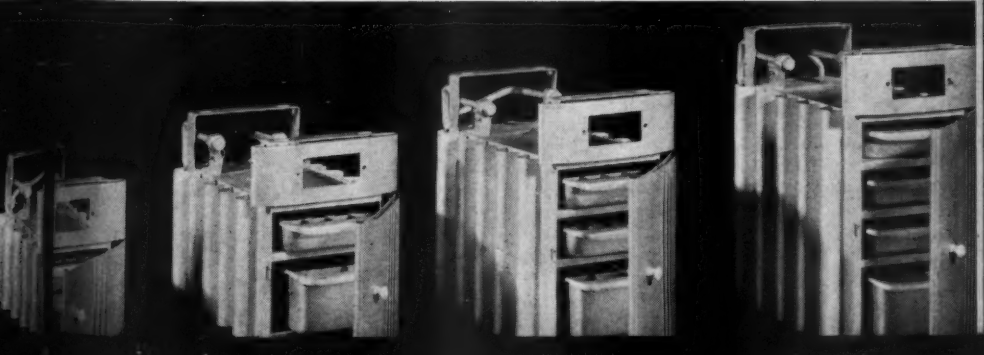
Write for specification sheet.

FEDDERS MANUFACTURING COMPANY, INC.

Buffalo, N. Y.

Atlanta Boston Chicago Cincinnati Dallas Detroit
Los Angeles New York Philadelphia

Export Distributors: Melchior, Armstrong, Dessau Co., New York City



For cabinets containing fruits, fresh meats, butter, eggs and vegetables, the velocity in the box should be somewhere between 31 and 40 feet per minute. The direction of air currents, also, has a very important bearing on the rate of drying.

The directional louvres on a forced-circulation unit should never be directed so the air is blowing directly on the meat. In low ceiling boxes, where the meat may be hung almost as high as the ceiling, it is advisable to direct the flow of air in a slanting direction toward the ceiling. This serves the purpose of taking the flow away from the meat, and also, effecting a drying action on the ceiling itself, where moisture will usually collect. In a high ceiling box, where the meat may not be within two or three feet of the ceiling, the unit may be hung high in the box, and the air flow directed horizontally above the meat.

The subject of humidity in meat storage space is rather a lengthy one, and it is impossible for me to go into all the angles of it here. However, I hope the few thoughts and suggestions I have given you will be of help in guiding you in your own studies on the matter.

SHUTTING OFF A SYSTEM FOR THE WINTER

QUESTION 311. I recently had a call to shut down a household unit, which was not to be used for a long period of time, and was a little at a loss to know just what procedure to follow.

I would appreciate your advising me what should be pumped down, and what shut-off valves should be closed on either the flooded system, the dry expansion system, or the high float system, provided they all have shut-off valves.

ANSWER: All household refrigerators which have a receiver as a part of their equipment should have all the gas pumped down and held in the condenser and receiver when shutting them off for an extended period of time.

This, of course, will be done by shutting off the receiver valve, allowing the machine to run until zero lbs. pressure has been reached on the lowside, after which the machine can be disconnected from the electrical outlet and both compressor valves closed.

On capillary tube systems, or on the lowside float systems where the condenser and float do not have sufficient capacity to hold

all of the gas, it is only necessary to close both compressor valves, and disconnect the electrical connection.

The most important part that requires any protection during the long shut-off period is the compressor seal; therefore, the reason for the above instructions.

KELVINATOR HIGH-SIDE FLOAT WHAT SIZE THERMAL CUT-OUT?

QUESTION 312. I have a Kelvinator domestic high-side float in receiver liquid temperature valve at evaporator, Model A compressor, that defrosts on the top half of the evaporator.

Running time, cycle, box temperature are all okay. Door gaskets are good, and it does not frost back at any time. The oil charge in the compressor is okay, according to Kelvinator service manual (2¼ inches). When only a few ounces of gas were added, the suction line frosted back at cut-out point. Can you suggest anything besides removing and cleaning evaporator to remedy this condition?

Is it possible to protect a motor capacitor by a thermal cut-out in Ranco control, or by a fuse? If so, how can capacity of fuse be found if capacity of motor (input) and mfd. of capacitor are known?

ANSWER: If as you say in your letter, this Kelvinator unit has sufficient gas and oil in it and the running time and temperatures are satisfactory, it leaves only two possibilities which may correct your trouble of defrosting the top of the evaporator.

First, is that the evaporator temperature is a little higher than it should be. Second, is that the thermostat bulb is too low on the evaporator. The flooded-type highside float systems have a tendency at all times to defrost the top of the evaporator during the off-cycle, due to the long holdover they have in comparison to the dry-type system. I believe your best method of overcoming this would be to attach the thermostat bulb at a higher point on the evaporator, which would have a tendency to decrease the temperature of the evaporator and lower the whole range of operating temperatures.

Every refrigerator motor should have some type of motor protection—either a fuse or a thermal cut-out. A fuse, however, will not be any protection to the capacitor, and is very often of little protection to the motor, since they have to be rated so much higher than the motor ampere rating that they will not blow before considerable damage is done to the motor.

A thermal cut-out will give some protection to the capacitor and very good protection to the motor. It will protect the capacitor only through the fact that it will prevent excessive currents passing through it and will usually stop the motor when, for some reason, it will not throw off the starting winding. As a general rule, the heating element in the thermal cut-out should have an ampere rating of about 25 percent greater than the motor ampere rating. These elements, as you know, may be obtained in almost any size desired.

HOW DOES SHORTAGE OF GAS AFFECT EXPANSION VALVE?

QUESTION 313. On a domestic refrigerator, how does a shortage of gas affect the operation of an automatic expansion valve with respect to the suction pressure? At times, I have been uncertain as to whether an expansion valve was faulty, or the system slightly short of refrigerant, judging from the erratic action of an expansion valve.

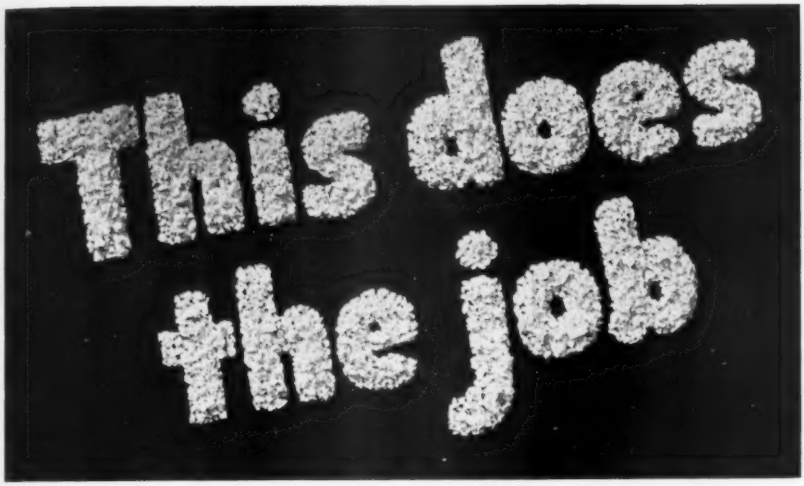
ANSWER: Where a system is short of gas to the extent that only vapor is reaching the automatic expansion valve, the suction pressure will remain constant, but of course, a very noticeable hissing noise will be heard at the valve.

Will Show Fluctuation

Where the system is slightly low enough on gas so that alternate slugs of liquid and vapor reach the expansion valve, I would say that the suction pressure will vary somewhat. This would be due to the fact that while vapor only is passing through the valve, the valve would be in a wider open position than when liquid was passing through it, and when a slug of liquid reached it, it would cause the pressure to go up slightly in the evaporator before the valve would have time to close sufficiently to adjust itself to the liquid passing through it.

This amount of variation will depend somewhat on how fast the valve will react to that higher pressure, and to how much pressure drop there is through the evaporator. The variation probably will not be more than 2 lbs. in most cases, and it is possible in some evaporators that the drop in pressure through it would almost absorb any noticeable variation at the compressor.

Some valves, of course, may be a little sluggish in action, and may not react as readily as others to the change in pressure.



of removing moisture from refrigerants

There's only one practical way to be sure you get all the moisture out of a trouble-making refrigerating circuit: Be sure you have a good drying agent which removes water from the system.

You *are* sure when you use Activated Alumina. Both laboratory tests and actual service experience prove that it ends trouble by removing water. It is not an antifreeze. It can be used with any refrigerant, and it doesn't soften, swell, or dissolve. It also removes acidity, which prevents further dilution, decomposition, and corrosion.

Leading makers of dehydrators supply equipment designed for Activated Alumina. Ask your jobber. Don't forget to say, "Activated Alumina." ALUMINUM ORE COMPANY. (*Sales Agent:* ALUMINUM COMPANY OF AMERICA, 2159 Gulf Building, Pittsburgh, Pennsylvania.)

These Manufacturers Supply Dehydrators Charged with Activated Alumina

•

American Injector Co.
Fedders Mfg. Co.
Henry Valve Co.
Iceless Refrigeration Accessories Inc.
Imperial Brass Mfg. Co.
Kerotest Mfg. Co.
McIntire Connector Co.
Mueller Brass Co.
Perfection Refrigeration Parts Co.
Cyrus Shank Co.
Universal Cooler Co.
Weatherhead Co.

ALORCO
Reg. U. S. Pat. Off.

ACTIVATED ALUMINA

CURES CLOGGED REFRIGERATOR VALVES

A Generation in Refrigeration Service

By A. HULBERT

MY first real interest in refrigeration came about while I had charge of the sales and service of ice cream for one district of a large creamery.

At that time all refrigeration used in homes, also in stores, markets, restaurants, etc., except in a very few of the largest, was from ice. When a temperature below freezing was required, as in soda fountains and ice cream cabinets, salt was added to the ice to induce it to absorb heat and melt at a temperature below thirty-two degrees.

The refrigerating outfits of that time were largely of single cylinder upright design up to five horsepower, and twin cylinders from that point up to the very large ones, which were largely of horizontal construction. The expansion valves used were like the ordinary hand shut-off valves such as are used to shut off steam. A few automatic expansion valves were coming into use at that time. They were constructed along the same lines as were the steam and gas reducing valves then in use, and, in fact, have been in use with some minor changes ever since. During this period of perhaps two years I serviced several of the old-time ammonia outfits, ranging in size from about two to five tons. They were of very simple construction and operation, and I found the service not especially difficult. As the owners bought quite heavily of the dairy products we sold, and I did the service work during business, with the approval of the manager of the territory, no charges were made other than for material used.

Up until this time the only refrigerant used in a commercial way, except some carbon dioxide outfits on ocean liners and in hospitals and other institutions, was ammonia. It was tried more or less in the early efforts to devise successful small commercial units. Its alkaline reaction on oil, its tendency to develop inertness after being in use for a moderately long time, and its great efficiency made it unsuitable for the small outfits. It being more than three times as efficient as its nearest rival, sulphur dioxide, required that less than one-third the quantity be circulated to do the same work.

The first refrigerating equipment I ever saw small enough to be suitable for a household box was one running with carbon dioxide and exhibited in a store window on the west side of Woodward Avenue, about two blocks north of Grand Circus Park in Detroit. I think this was the year following the close of the World War. I made some inquiries, but do not remember much about its construction or operation.

A few years after the close of the World War several small refrigerating outfits were developed and put on the market, the most prominent ones being Frigidaire, Nizer ice cream cabinets, Servel and Kelvinator. These were rapidly followed by many others.

About this time the Detroit Creamery brought out a one horsepower ammonia compressor for use on soda fountains. It was constructed on much the same lines as the water-cooled compressors of the present time. The body was a regular two cylinder type; the condenser a double steel tube coil. The water was turned on and off by an ingenious device on one spoke of the flywheel. When the speed of the flywheel reached a certain point, a weight pushed against a spring and into a position so it would strike a small lever and turn on the water. When the speed slowed down in stopping, the spring pushed the weight back so it struck another part of the same lever and turned the water off. An automatic expansion valve was used and was usually placed under the floor as near the fountain as possible.

Some fountains were built with ammonia coils and brine tanks and others were rebuilt so as to be used with mechanical refrigeration. Thermostatic controls were used, but could not be as easily adjusted as the ones in use now. We nearly always changed the

temperature by raising or lowering the thermostat bulb in the brine. Raising it into the warmer brine toward the top made the outfit run colder, while lowering it into the colder liquid near the bottom would make it run warmer.

About this time or just a little later I had a strange experience. In a small cross-roads country town on a main highway I called to solicit at a Greek restaurant. The owner asked me if I knew anything about refrigeration, and I replied, "A little."

He took me into the kitchen and showed me an almost square box equipped with copper coils made up so as to be almost like the coils in use at the present time, except they had no fins. An automatic expansion valve was used, and the refrigerant was sulphur dioxide. The compressor was a twin cylinder outfit with a bolted steel frame and was made up in much the same way as the more simple ones at the present time. A thermostatic control was used and the outfit did good work as long as I was in that section. The strange part of it was I was never able to learn who made or sold it. There was no nameplate or other mark on it, nor ever had been, as far I could learn. The owner got it with the place when he bought it, and the former owner went to a distant city. I never saw another one like it; neither was I able to find anyone who had, or could give me any information about it. As it had some indications of being shop made, I have thought perhaps some very versatile and ingenious mechanic familiar with ammonia outfits of that time made and sold it, but left off all marks of identification for fear of patent infringements.

Some of the very first of the ice cream cabinets had no shut off valves. When the serviceman found it necessary to change a float valve all he had to do was to get the brine real cold, let the low-side pressure come up to atmospheric, get the birds and other pets, also the house plants into a safe place, turn the cabinet on its side with the float valve side up, open all doors and windows, put on his gas mask, and go to it. Occasionally the serviceman forgot something and then there was a bird or a few plants to pay for. Sometimes the birds or plants had a much higher value after death.

Some of the earlier shut off valves on some of the makes had no back stops, and if the serviceman kept on turning the stem to the

left, it would finally fly out. I well remember my first experience with an accident of that kind. I turned it too far, and the liquid line valve stem shot out onto the floor. I picked it up very quickly, held my breath, put it into its place, caught one thread, and then struggled to the door. It is almost needless to say that I carefully counted the threads as I turned it back in, and that I did not forget the number for several years.

The early Frigidaire compressors for both ice cream cabinets and household were of the dome and body design. A large number of these were made and sold. Only a few years ago some of the first one thousand were still in use. In this model the cylinders, water-cooled condenser, receiver, crankcase and gear case were all built in together, and a geared-in motor was bolted on at the gear case. These were fairly quiet and efficient outfits made in one-quarter and one-third horsepower.

Early Kelvinators

Kelvinator, during the early years of the industry, made a compressor with body, condenser, receiver, and motor assembled on a wooden base with legs bolted on. As far as I know these were the first outfits using "V" belts for the transmission of power from the motor to the flywheel. Servel's first commercial models and many of the other very early ones used flat leather belts.

The early Nizer ice cream cabinets were a one cylinder dome and body outfit with a perpendicular universal motor geared in at the end and above the gear case. They were an efficient outfit, but between the control switch and the perpendicular motor they kept the serviceman busy if he had many to look after.

Early Servels

The early Servel models were made on very much the same lines as the smaller commercial compressors of the present, except they had flat leather instead of "V" belts. They were efficient outfits operating with methyl chloride. They used a high-side float valve, which sometimes worked and sometimes did not. Brine tank evaporators were used. There were quite a few other makes of compressors that were along regular lines and were efficient pumpers that were put on the market about this time.

From the very beginning of small unit refrigeration and continuing for five or six years or longer, many freak outfits were designed and put on the market. Some operated fairly well, others not so good. Nearly all were more or less difficult to service and were not satisfactory to the customers. Only a few were sold in large enough numbers to enable the carrying of even a fair stock of parts, or for servicemen to learn enough about them to be able to render even fair service. It would appear to be the main object of the designer, not so much to produce something of high quality and efficiency, as to make something very much different from anything that had been made before. Even now some of the manufacturers are occasionally making changes which mean nothing so far as real improvement in the equipment is concerned.

During the first few years of the use of sulphur dioxide the servicemen were not as familiar with the effect of it as they became in later years. Not a few choice plants, also shrubbery, had to be paid for by the ones having servicemen in the field.

In Michigan about fifteen years ago a serviceman was called to one of the finest country clubs in the state. He found it necessary to discharge the system, so he ran a line out of the basement window. From that point in the direction the wind was blowing was a wide stretch of choice shrubbery running about one hundred and fifty feet. In about two days the club manager called the creamery officials. He said that all of the shrubbery on that side of the building was killed, and he wanted him to come out right away. They all agreed that the shrubbery was dead so finally settled for seven hundred dollars. Two or three months later they were out in that locality and thought they would go and see what had been done to replant the shrubbery. To their astonishment they found it was back to life again and growing as thriftily as ever.

In the very beginning of the industry the brine tank with coils inside was about the only thing thought of by those interested in mechanical refrigeration, the principal idea being that of a cake of ice that remained constantly. It has been much the same all through the years.

Many of the early commercial, as well as the household outfits, had brine tanks. A lit-

tle later when the first fin coils came into use, many of them were placed directly on the ice racks and were expected to take the place of the cakes of ice which they had displaced. Since coming to Buffalo ten and a half years ago, I have probably taken thirty or forty coils off the ice racks and placed them on other supports.

First Evaporators

The early evaporators were nearly all of the flooded type, the commercial ones being a development from the household designs. The first were quite high with boilers on top, and the later ones, long and low with boiler on the end. Later the dry expansion evaporators came in, displacing the flooded types in all new installations. The evaporators brought out the past two years are, I think, far superior in design to anything yet produced.

It was the invention and development of the thermostatic expansion valve that brought about the change from the flooded system to dry expansion. This development permitted the use of low pressure control with multiple installations.

In Philadelphia in 1927 we discovered some commercial coils on which the solder then in use had corroded badly, in some instances sufficient to cause leaks. This was reported to the engineering department in Dayton, Ohio. After some research as to causes, conducted in Philadelphia, and hundreds of experiments with different solders in the Frigidaire Research at Dayton, a silver alloy solder was developed which withstood the test of time.

Refrigerants

The refrigerants in use at the beginning of the small units were largely sulphur dioxide with a very few ammonia and methyl chloride machines. Since then, many different refrigerants have been used in a multitude of different outfits brought out all through the years. A few of these refrigerants have fallen by the wayside and machines are no longer designed for their use. They have been replaced, however, by others and at this time there is an increasing popularity toward Freon, Methyl Chloride and F-114.

Random Suggestions

By W. HALL MOSS

New Motors

IT is within the power of the service and installation man to render a service to the user of new motors and the manufacturers of same. Quite often motor users are faced with unnecessary complications, when motors appear to give trouble during their period of guarantee. Also at the same time, the motor manufacturers are frequently required to assume unreasonable service costs. This has been traced to the fact that in about 90 percent of the service calls on motors during the guarantee period the trouble is other than motor troubles.

Presenting the customers' expectations in regard to service we can express them in the following way:

1. Prompt attention in answering a call when trouble occurs.
2. Speedy restoration of service.
3. Definite report regarding cause and correction of trouble.
4. Impartial analysis of the trouble and the proper placing of the responsibility for the cause of the trouble.
5. The fulfilment of guarantee.

The service engineer who fills the following requirements is the one of most value to the profession he follows:

1. Renders a prompt and impartial emergency inspection service to the user.
2. Seeing that the customer is protected by the manufacturer's guarantee if such protection is due him, and if not due him, sees that the customer understands the reason he is not due protection, and that his trouble is corrected.

3. Saves the motor manufacturer the expense of making calls in remote places, and the expense of service not warranted by his guarantee.
4. Reports and restores promptly all troubles accurately and sees that proper action is taken for adjustments, when due.
5. Protects the customers' side on an equal basis as the manufacturers' side.

In all cases it must be remembered by the serviceman that "good will" is at stake. The trouble must be corrected, regardless of what this good will costs. The customer takes the idea that the cost of such operation is of no concern of his. The firm selling the equipment is held responsible and final payments are often held up, pending adjustments. But in most cases the manufacturers are fair-minded and if the serviceman uses the policies outlined herein to the best of his ability, he can expect full co-operation from the manufacturer, dealer and customer.

Causes for motor trouble are as follows:

1. Bearings not properly oiled.
2. Improper lubricants used.
3. Failure to insulate for noise.
4. Improper over-current protective devices, causing stopping.
5. Improper wiring connections, causing failure to run and heating.
6. Low voltage on account of improper wiring, or source of supply low.
7. 110 volt connections and supply when 220 volt motor and supply should be used for the type of service required of the motor. Improper voltages.
8. Belts too tight.
9. Belts too loose.
10. Improper size motor for the application.
11. The wrong kind of starting and stopping controls, or their connections.
12. Misapplication of type, speed, or duty rating.
13. Wrong kind of current, wrong cycle or phase, on source of current used.
14. Improper installation, base, belt adjustment, conduit connections, etc.
15. Neglect of maintenance after installation.

In most communities there are qualified service engineers who can handle these calls at a fair price. They can be just as effective in keeping the motor sold as in selling it.

The manufacturer of motors should assist

in this work by keeping a stock of spare parts and complete motors where they are available to the service man and his dealer, to protect the dealer and his customer. Then the service man must have the authority and the equipment to carry out his part of the outlined program.

It is this careful attention to new motors that shows the service man's ability to take care of the user's old equipment, makes new sales and keeps down excessive service complaints on the manufacturer and his dealer.

Make It Better

So many service engineers in repair work are content to just repair the job, using the same size, type and make of controls, valves, thermostats, etc., as are already on the job. They fail to grasp the opportunity so often before them to sell other type controls more suitable for the job, different make or size expansion valves according to the type of job. Then there is a large field for selling new types of coils and of the proper size instead of those in use. On large water cooled jobs there is a large field for selling cooling towers, evaporative condensers, instead of a new water valve. Even another opportunity is to sell new compressor units either as replacements or in addition to the unit in use, by splitting the load on several separate low sides. Don't let some salesman do all the selling. The opportunity is there for you to take advantage of if you will. There are endless ways you can make money for yourself by finding out how you can benefit the user of equipment you are called upon to service. It is not how many service calls you make in a day or a year that brings in the most profit to you, but in how much you can realize off of each call. Make a study of each call and see how much you can help out the customer then you will be benefiting more and more, according to how much you can sell him. Don't sell the customer something he does not need. Try to make it better—not try to get the call off your hands and make another call.

Four Ideas for Service Shops

Every one who has a place of business desires these four things before all else:

1. They want to attract more customers into their place of business.
2. They want their place of business to look in keeping with charges made.
3. They want to sell more than the customer originally anticipated buying.
4. They want to create the impression that they are successful.

These four things can be done by neat arrangement of office furniture, parts on display, show windows not too crowded, and by proper lighting of the place of business—not only out where the public passes by, but inside where the customer comes in to see you. First you must attract the public into your place of business, then you must keep up the impression made out front. Don't kill a good show room or show window impression by having your office and shop dirty and improperly lighted.

In passing one finds that one refrigeration dealer is prosperous and another poor. One service man is good and another is just so-so. You see it everywhere.

The principal difference is what the man knows, the usable experience he has to draw upon when he needs it. It can be his own personal experience, or it can be knowledge that he has gained from watching the experience of others. It can come from reading. It may have come through school, university, or correspondence courses (if properly assimilated). But the idea is—he has this knowledge and in a pinch he knows what to do. It is on this foundation that he builds his job, his reputation and his life.

All men do not have the same opportunity to gain broad personal experience. The size of the town in which he lives, the kind of work he starts life off with, all have a bearing on his future. Then there is the element known by some as luck or chance. But there is no luck or chance in the opportunity that every man has of gaining experience, and that is through reading. He can get it, if he really wants to, and that experience, coming from many men, is broader and of much more value.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

PLAN TO ATTEND R.S.E.S. CONVENTION

ALTHOUGH seven months remain before the R.S.E.S. convention, many members have already made plans to insure their attendance at this meeting and to witness the large exhibit of manufacturers' products.

The convention will be held in the Stevens Hotel, Chicago, January 15-18, 1940, in conjunction with the 2nd All Industry Refrigeration and Air Conditioning Exhibit.

Even at this advanced date nearly 100 exhibit spaces have been definitely reserved, an indication that the manufacturers' display of products will undoubtedly provide the largest showing of equipment and accessories ever shown under one roof.

The Society plans will be in work at an early date and committees will be actively planning for an outstanding program.

* * *

YOU KNOW MY DAD— AND MOTHER TOO!

DAD has been interested in the R.S.E.S. since the early days and I can tell you he is anxious to do a good job. I'm for him and I know the interest he takes in promoting good refrigeration servicing.

Mother does her share too and many of the ladies of the auxiliary are acquainted with her. I just celebrated my first birthday and some day I'll be as good a service engineer as my dad.

Oh, yes—Dad's name is Claude and

RICHARD BRUNTON

Mother's is June. I'm Richard Morgan Brunton of Huntington, W. Va.

JOHN PAYNE IS VICTOR IN LOS ANGELES CONTEST

AMID an atmosphere of excitement resembling that created by a closely played ball game or a photographic finish horse race, members of Los Angeles R.S.E.S. Chapter staged a tube-bending contest on April 26. When the smoke of battle had cleared away from the eight contestants, John Payne emerged the victor.

The contest was held as part of the Chapter's regular meeting at Rainbow Isle, Mayfair Hotel, Los Angeles, and approximately 125 were present.

Pacific Metals Co., Los Angeles, sponsored the very complete entertainment program which featured the evening.

The contest was conducted along the same general lines as that held at the national R.S.E.S. meeting in Buffalo last fall and fittings, rules and blueprints used were furnished by The Imperial Brass Mfg. Co., Chicago.

Contest Entries

The eight men taking part in the contest were: John Payne, W. B. Decker, Harold McQuay, Gene Le Gault, C. W. Flewelling, Lewis Barber, Faust Doore, and Paul Kieffer.

After the final check-up of the judges had

been completed and penalties had been added, it was disclosed that John Payne had won with a total elapsed time of 1380 seconds. Paul Kieffer was second with 2130 seconds, and C. W. Flewelling third with 2325 seconds. It is interesting to note that Paul Kieffer, who won second, was the last to bring his completed project to the judges' table, proving that the race does not always go to the swift.

THE EIGHT CONTESTANTS IN THE LOS ANGELES TUBE BENDING CONTEST

Winners in the contest were: First place, John Payne (second from left in front row); second place, Paul Kieffer (front row right); third place, C. W. Flewelling (third from the left front row).

Prizes were provided by the Pacific Metals Co. and consisted of: first prize, Toastmaster Hostess Set; second, electric drill; and third, five-in-one Soldering Outfit. In addition to these three prizes, there were five qualifying prizes consisting of a case containing six screwdrivers for each of the other contestants.

The meeting was preceded by a dinner, after which there were a number of acts of entertainment. The business meeting included initiation of five new members.

TRI-STATE AUXILIARY

A MEETING of the Tri-State Auxiliary was held May 8 at the home of Mrs. Carl Ackley, Portsmouth, Ohio. The meeting was called to order by Mrs. C. A. Brunton. The dinner that had been scheduled was indefinitely postponed, but a social hour was enjoyed by both the ladies and their husbands. The pictures taken at the fish fry were shown, and orders were taken for same.

Chapter Notes

Under this heading will appear news of the chapter meetings. For names of the officers and dates of regular meeting nights, please refer to the Chapter Directory.

CORRECTION

Under chapter notes for Missouri Valley Chapter in the March issue the following statement appeared: "Mr. Ferguson gave a resumé of the code as used in Kansas City and Mr. Joe Dempsey described the code as used in Chicago."

This statement is in error and should have read: "Mr. Ferguson read a letter stating who is permitted to do installation work in Kansas City and Mr. J. Dempsey described the handling of such work in Chicago."

TWIN CITIES CHAPTER

May 9th—The meeting was called to order by President W. V. Warner and the business of the evening disposed of.

Mr. Warner turned the meeting over to Mr. A. Palen, chairman of the Educational Committee, and Mr. Palen very efficiently demonstrated the General Electric hermetic unit supplied by the National Society for the chapters' educational programs. The demonstration was very well presented and much enjoyed by those in attendance.

LONG BEACH CHAPTER

May 5th—In the absence of the President, the meeting was called to order by 2nd Vice-President E. Langston.

Following the roll call of officers, the reading of minutes, and various other business routine of the evening, some discussion was held under "the good and welfare" of the Society. This discussion led to another on the subject of group insurance and Mr. A. Pregler was appointed as a committee of one to report at the next meeting on any information he had been able to obtain.

PITTSBURGH CHAPTER

May 12th—There were approximately 200 members and visitors present at this meeting, which was held in the Fort Pitt Hotel.

Mr. H. S. Stockdale introduced Mr. T. McKee of the Detroit Lubricator Co., who presented a talking film-slide on Detroit expansion valves and controls. After the showing of the film Mr. McKee started a discussion on controls and gave a detailed description of the Model 450. The lecture proved to be very interesting.

Refreshments were served following this program, which gave the members and vis-

itors an opportunity to get acquainted and discuss topics of interest.

DAYTON CHAPTER

April 28th—The meeting was held in the Kiefaber social room, with a goodly representation of members and non-members present.

Mr. T. McKee of the Detroit Lubricator Co. was the speaker of the evening, and presented a very interesting program on the products manufactured by his company.

After the meeting had been adjourned, a lunch was served, which provided an enjoyable and informal get-together.

May 12th—The meeting consisted primarily of business which had been held over from former meetings.

It was decided that the next meeting should be held at 66 Stratford Ave., and invitations were ordered sent out to all prospective members. A factory representative will be present for the meeting as a part of the entertainment, and refreshments will be served.

WICHITA CHAPTER

April 21st—The meeting was held in the Kansas Gas and Electric Co. building, and was called to order by President F. W. Ryan. The business of the evening was dispensed with and reports from the Secretary and Treasurer were referred to the Auditing Committee.

Some discussion arose regarding the formation of a Ladies' Auxiliary. However, since nothing definite was accomplished the matter was tabled to a later meeting.

A suggestion by the members present brought about the decision that the next meeting would be devoted to the subject of air conditioning problems.

May 5th—After the usual routine of business had been dispensed with, the meeting was turned over to Mr. G. B. Govits, chairman of the Educational Committee, who gave an interesting demonstration on figuring the heat loads encountered in air conditioning installations. This demonstration was very instructive and much enjoyed by those present.

Mr. Govits later announced that at the next meeting a representative of the Mueller Brass Co. would be on hand to present an educational program.

BOSTON CHAPTER

April 24th—The greater part of the evening was devoted to the election of officers, with the following results:

President, M. P. Handspicker, Miller & Seddon Co., Cambridge, Mass.

1st Vice-Pres., W. W. Welch, Jr., W. W. Welch Co., Medford, Mass.
2nd Vice-Pres., R. Perkins, Ipswich, Mass.
Secretary, J. Minon, Fedders Mfg. Co., Boston branch.
Treasurer, J. L. Hall, Nashua, N. H.
Sgt.-at-Arms, E. A. Ohlson, Legasse & Harris Co., Cambridge, Mass.
Directors: M. Antonelli, Acme Ref. Co., Fall River, Mass.; C. Borden, A. E. Borden Co., Boston, Mass.; R. R. Seddon, Miller & Seddon Co., Cambridge, Mass.; W. C. Chase, N. B. Gas & Light Co., Marion, Mass.; H. Walker, Detroit Lubricator Co., Boston branch.
Chairman of Educational Committee, C. C. Harris, Legasse & Harris, Cambridge, Mass.

On May 8th the chapter had a tube bending contest, sponsored by the Imperial Brass Mfg. Co., and their Mr. Byrnes and Mr. Burk acted as director and timekeeper, respectively.

The contest was started at 8 o'clock and lasted until about 9:30, at which time refreshments were served with the Imperial Brass Co. as host.

The contest was one of great interest to everybody and the spectators as well as the contestants were very much enthused. The results were as follows:

Mr. Flanagan of Boston won first prize, by setting what is believed to be a national record—14 minutes flat. His work was inspected and carefully checked by three very able judges, who were Mr. N. C. Honecker, Mr. Charles Harris and Mr. O. A. Alexander.

Second prize was taken by the Treasurer of the chapter, Mr. J. L. Hall, of Nashua, N. H. His time was 24 minutes. If you do not believe that they are strong in New Hampshire, ask the judges. They had to use wrenches to loosen the fittings that Mr. Hall had tightened with his hands.

Third prize went to Mr. Lewis McGrath of Boston. His time was 27 minutes and don't you think it was an easy project. Each contestant had to move right along to keep in the running.

All told there were eight contestants.

MISSISSIPPI VALLEY CHAPTER

April 28th—In order to give more assistance to the Educational Committee, Mr. John Sackey was appointed as a member of this committee. One of the jobs assigned to Mr. Sackey was that of compiling a list of questions and answers to be used in the forthcoming program. He was asked to work with Mr. E. Ford on this program.

After the meeting was adjourned, an in-

formal get-together was enjoyed by those present.

May 12th—Some discussion was held on the educational features of future meetings, and the Educational Committee was instructed to outline a program for the approval of the meeting. It was suggested that the Committee start with the elementary stages of refrigeration such as definitions and calculations of the heat unit.

It was suggested by Mr. Eldridge that the chapter purchase a blackboard to be used in future meetings. It was felt that this would help materially in illustrated talks and discussions.

MONTGOMERY CHAPTER

May 12th—Though the chapter has been in the habit in the past of meeting only once a month, it is felt that sufficient business and educational matter is waiting for discussion so that meetings should be held in the future twice a month—one meeting a month to be devoted entirely to business and educational programs, and one to a social gathering.

May 19th—The evening was devoted to a social evening held at the Narrow Lane Inn. The wives and girl friends of the members were invited and everyone seemed to have a thoroughly good time.

The only business discussion during the evening was that of the desirability of meeting every Thursday night for either a business session or social evening.

LOS ANGELES CHAPTER

April 26th—The meeting was held in the Rainbow Isle of the Mayfair Hotel, and was called to order by President Rodgers. After the usual business of the evening, splendid entertainment was provided through the courtesy of the Pacific Metals Co., and was very much enjoyed by those present.

Several new members were initiated into the chapter and welcomed by President Rodgers.

The balance of the evening was devoted to a tube bending contest which is fully described on other pages of this issue.

MONUMENTAL CHAPTER

May 3rd—The major part of the evening was devoted to the election of permanent officers for the recently formed chapter. The election was conducted in the usual manner through the method of ballot and the results were as follows: *President,* H. H. Gibbons; *1st Vice-President,* E. E. Starkey; *2nd Vice-President,* H. R. Welkner; *Secretary,* J. B. Ottenheimer; *Treas-*

urer, H. Goodhart; *Sergeant-at-Arms,* Wm. Mattheis; *Directors:* W. Fogle, G. Snelling, H. Salley, H. Makosky, F. Goodhart; *Chairman, Educational Committee,* E. Zimmerman.

ROCKFORD CHAPTER

May 1st—The first order of business for the evening was the drawing for the attendance prize, the winner of which was Mr. R. Erickson of DeKalb, Ill.

Some discussion then arose regarding the desirability of holding a banquet for the purpose of securing additional members to the chapter, expenses of the banquet to be paid by the chapter treasury.

Following the business session the meeting was turned over to Mr. F. Barney, chairman of the Educational Committee, who introduced Mr. C. E. Johnson of Peerless of America, Inc., who gave a talk and demonstration of Peerless products.

ST. LOUIS CHAPTER

April 27th—After a brief outline explaining the special meeting, President Huhn introduced Mr. Chas. Anderson of the Imperial Brass Mfg. Co. who, together with Mr. George Franck, their chief refrigeration engineer, covered the products' story as it concerns their line of tools and fittings, with special emphasis on their "Sylpak" valves.

At the conclusion of his talk, Mr. Anderson outlined the rules governing the tube-bending contest, after which Secretary Plesskott announced that the following individuals were present and ready—Messrs. Wm. Blanke, E. C. Fix, Page Holliday, F. J. Karl, C. Ochs, J. O. Spitznagel, and L. L. Vollman. Several other visitors signified their desire to enter the contest, after this announcement, but not having brought their tools, were unable to do so.

It was explained that the winning non-member would have the choice of a paid-up membership or any of the valuable merchandise prizes on display. The chapter member finishing highest would receive a No. 500C HiLo charging and testing unit, and the members finishing next in order, a No. 174F Imperial tube cutter, and third prize, a 127F Junior tube cutter.

President Huhn, after having previously appointed the necessary judges and time-keepers, announced that immediately following the judges' decision, a drawing would take place for three attendance prizes. The judges, Messrs. M. Bridges, S. Nill Moehler,

VIEWS OF ST. LOUIS BENDING CONTEST
(1) The three winners—left to right—Past President L. L. Vollman, Vice President E. C. Fix and Mr. Wm. Blanke. (2) Front left, Mr. C. Ochs, rear, Mr. P. Holliday. (3) On floor, Past President L. L. Vollman. Standing behind him, left to right, Judge S. Niel Moehler, Robt. Weickert, Timekeeper, M. Brown and Mr. Chas. Anderson of Imperial Brass. (4) Mr. J. O. Spitznagel doing his stuff.

and R. Weickert, and timekeeper, Mr. Manuel Brown, were then introduced by Mr. Anderson.

Winner of the contest was Mr. Wm. Blanke, a non-member who chose the opportunity of affiliation as his prize. His elapsed time was 22 minutes, 5 seconds; runner-up was Vice-president E. C. Fix with an elapsed time of 35 min. 35 sec. but with a perfect project as his reward. Past president Vollman won the next award, his elapsed time, 23 min. 50 sec. The work of all other contestants, due to the rules of the contest, had been automatically disqualified.

The attendance awards in the order of their drawing and choice of prizes, were as follows: Mr. O. H. Gerken, a single cylinder compressor, Mr. Mac Bridges, a slide rule, and Mr. Jack Goldberg, a one H.P. Frigidaire thermo-expansion valve.

CLEVELAND CHAPTER

March 9th—President W. W. Farr told of the joint meeting in Akron, to which all chapters located in the state of Ohio had been invited. According to Mr. Farr's report the chapters were very enthusiastic in their attitude toward the proposed construction and installation standards for the state and all had pledged their cooperation.

March 23rd—The meeting was devoted to a presentation of products manufactured by Peerless of America, Inc., and to a showing of moving pictures taken by Mr. and

Mrs. M. W. Knight during a trip through Mexico.

April 13th—The educational program for the evening was provided by the Minneapolis-Honeywell Regulator Co., who led a discussion on the Polartron and other types of refrigeration control systems.

April 27th—The major part of the meeting was devoted to a demonstration and discussion presented by a representative of the Detroit Lubricator Co.

* * *

KANSAS CITY LADIES' AUXILIARY

ON March 14th the ladies of the Kansas City Chapter met for the purpose of organizing an auxiliary to the chapter. There were eleven ladies present and after a thorough discussion and description of the purposes and objects it was decided that a chapter would be formed.

Officers for the ensuing year were elected and those selected were as follows: *President,* Mrs. O. R. Irwin; *Vice-President,* Mrs. T. L. Anderson; *Secretary,* Mrs. A. M. Hoover; *Treasurer,* Mrs. J. P. DeWilde; *Sergeant-at-Arms,* Mrs. H. Andrews; *Board Members,* Mrs. F. A. Thompson, Mrs. R. F. Cox and Mrs. H. L. Green.

In a meeting held March 28th many of the details were thoroughly ironed out and definite plans laid for the future activity of the auxiliary.

It was decided that the meetings should coincide with those of the men's meetings and the place should be as close as possible to provide convenient means of getting to and returning from the meetings.

On April 11th plans were laid for the first dinner dance to be held by the auxiliary during which the installation of officers would take place.

On May 6th the auxiliary held a dinner dance and card party. The officers of the auxiliary were introduced by Mr. Jules P. DeWilde, president of the Kansas City chapter of the R. S. E. S., who acted as master of ceremonies. Installation of the following officers took place: Mrs. O. R. Irwin, president; Mrs. T. L. Anderson, vice-president; Mrs. A. M. Hoover, secretary; Mrs. Jules DeWilde, treasurer; Mrs. Harold Andrews, sergeant-at-arms. The officers accepted their respective offices with appropriate speeches. Mrs. T. L. Anderson repeated the poem "What Service Men are Made Of" taken from the December, 1937, R. S. E. S. magazine, which caused a great deal of laughter among the men.

Mrs. James Dunn won the attendance

prize. The guessing contest on a jar of beads was won by Mrs. R. E. Meeker and Mr. O. R. Irwin. The prize for the winning man was donated by Mr. Ernest Trammposh of the Refrigeration Equipment Company.

The R. S. E. S. A. banner was made of crepe paper by the ladies. The place cards were made of drawing paper, the men's to represent a service man, and the ladies' to represent a refrigerator.

Much credit goes to Mrs. Irwin and the entertainment committee for a very successful party, and for the decorations carrying out the auxiliary colors, blue and white.

KANSAS CITY LADIES AUXILIARY DINNER DANCE AND CARD PARTY

Combining the installation of officers with a dinner dance featuring several clever innovations, the ladies of Kansas City are now definitely organized and off to a great start.

HERBERT HALE MARRIED

FROM information we have just received, we learn that Herbert Hale, popular member and former secretary of the Central Indiana Chapter, has succumbed to the lure of a domesticated life and taken unto himself a wife.

Welcome to the ranks of the benedicts, Herbert, and in extending our wishes for a long and happy future to you and Mrs. Hale we know we are expressing the wishes of your many friends.

SCHLEMMER NOW WITH "SANDY" PRATT

RECENTLY we received a letter from John Schlemmer in which he informs us he is now contacting the trade for the genial "Sandy" Pratt of the California Refrigerator Company in San Francisco.

Mr. Schlemmer, it will be remembered, was formerly employed by the Rex Refrigeration Service Company, Inc., in Chicago. He moved to California in March of this year.

Among other things, he informs us in the letter that he is much impressed with the appearance of the shops maintained by the service companies in California, and with their methods of doing their work. Enclosed with his letter was a picture of the building occupied by Refrigeration Service Company, Sacramento, California, and because

Home of the Refrigeration Service Company in Sacramento, Calif.

it is interesting from the standpoint of its beauty and neat appearance, it is reproduced herewith.

The letter Mr. Schlemmer received with the picture from Mr. Holden of the Company follows in part:

"We try to make our work as easy and pleasant as possible by maintaining a completely equipped shop, which includes a steam cleaning plant, lathes, ovens, trucking service, etc.

"Our shop is owner operated, and has been since it started over ten years ago. We service domestic and commercial refrigerators, making a specialty of sealed unit work.

"During summer months, like others, we are quite rushed and this has forced us to adopt a queer system during these months. We plug up our telephone bell for June, July and August, because we get more work than we can handle through the front door, and this leaves us with no time to answer telephone requests. This system has gone on for a number of years, but we are in hopes that it will not occur again this year."

NEW CATALOGS AND BULLETINS

THE CYRUS SHANK COMPANY, 625 W. Jackson Blvd., Chicago, Ill., enjoys an outstanding reputation for quality and fair-dealing—one that has continued through the years. Only the highest grade materials are used in the construction of their products. Every mechanical detail is of the most practical design for long trouble-free service.

Unusually close tolerance plus rigid inspections maintained throughout manufacture and complete testing before shipping assure you of a product that will give maximum satisfaction.

Krupp Valves are well known throughout the refrigeration field for their advance design, high quality and reliability of performance. All Cyrus Shank products are guaranteed against defects in material or workmanship.

A new 24-page catalog listing the products of the company has just been issued. To secure your copy write the company direct.

THE AMERICAN BRASS CO., Waterbury, Conn.—A new 24-page catalog elaborately illustrated with 75 up-to-date pictures and charts has just been published by the American Metal Hose Branch of the American Brass Company covering Seamless Flexible Metal Tubing. The catalog contains complete discussions on the proper use of the product for conveying steam, liquids, gases; controlling vibration, connecting misaligned and moving parts, and the part that

Seamless plays in product design. There are also complete engineering data and specifications, with simple installation rules.

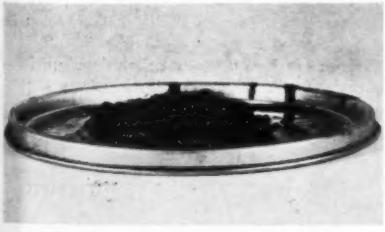
BRASS & COPPER SALES COMPANY, St. Louis, Missouri, announce the complete up to date 216-page Air Conditioning and Refrigeration Supply and Equipment catalog. This new catalog is just off the press, and contains the newest and latest items in the refrigeration and air conditioning field. The company's personnel stands at its greatest number in the history of the company. The Brass & Copper Sales Company are expecting to have their biggest and busiest season and are prepared for this with a large complete stock.

FRANK GILLETT CO., 3214 Beverly Blvd., Los Angeles, Calif., refrigeration supply jobbers, present their first catalog to the service and installation field. In doing so they have chosen a catalog in loose leaf form in an effort to help their patrons keep their catalog up-to-date with new items and prices.

The binder of the catalog is a standard ring type with a durable imitation leather cover. It contains 106 pages with plenty of space for additions. Supplementary pages will be mailed out at regular intervals as changes in prices, etc., take place.

SOME BENEFITS OF OIL SEPARATORS

SOME idea of the amount of foreign matter contaminating the refrigerating gases on commercial installations may be had by noting the size of this pile of hard



Dirt and carbon removed from an oil separator after four years of operation.

carbon and wax removed from an Aminco oil separator in use on a one ton SO_2 system for four years.

Originally the oil separator was applied to the system, which had been in service for

several years, to prevent oil slugging. During the four year period of operation the formation of hard carbon was prevented and the accumulation carried by refrigerating gases was trapped and kept out of circulation.

One definite benefit resulting from the use of the oil separator on this system was that it ran absolutely trouble-free for four consecutive years. It is not difficult to imagine the damage that might have been caused to expansion valves and compressor parts had the amount of trapped carbon and wax stayed in circulation in the system.

From the angle of benefit to the service engineer who had charge of this installation we learn that the customer is now thoroughly imbued with the necessity of using oil separators. Several new installations were given the service-man because of satisfactory performance of the system in which the original oil separator was installed. Originally the job had previously cost a young fortune in repairs and delays due to shutdowns.

When weighed, it was found that the volume of carbon and wax was slightly in excess of a quarter of a pound, more than sufficient to have caused losses far in excess of the original cost of the oil separator.

Aminco Oil Separators are manufactured in Detroit by American Injector Company and are on sale at leading jobbers everywhere.

TWO NEW FLARE NUT WRENCHES

IT has often been necessary for the Refrigeration Service Man to purchase three or four flare nut wrenches in order to get the sizes he requires and in the combination he usually needs.

Here are two new wrenches developed expressly for refrigeration service work, pro-

DOUBLE END FLARE NUT WRENCH.

viding the four usually required sizes on two handles. One of these tools has a ¾ inch and a 1 inch wrench opening—the other has a 7/8 inch and a 1⅛ inch wrench opening. The handles are built to give a good firm hand grip and leverage, and the heads are

specially designed to provide maximum strength with minimum wall thickness. These compact heads and double hexagon openings enable their use in extremely limited working quarters. Great care has been taken to broach the openings accurately in order to prevent wear on the soft brass nuts usually encountered. For further information address Snap-on Tools Corporation, Kenosha, Wisconsin.

S S S

NEW STEAM GENERATOR TUBE

(Continued from page 26)

per square inch. It is provided at one end with two heavy electrical terminals, welded or sealed directly into the glass. The chemical-resistant glass is capable of withstanding mechanical stress and will also withstand being transferred instantaneously from cold to boiling water, or vice versa, without cracking. Another threaded pipe is sealed into the opposite end of the envelope as a steam outlet. Resistance wire coiled on an insulating core occupies most of the interior of the heater, leaving, in fact, space for but five ounces of water at a time. This accounts for the fast initial steam generation.

The generator may be used for many purposes for which either no steam supply has been available or where the economy or convenience of the new method of steam generation is outstanding. The steam generated by the new device may be used for the sterilization of dishes, glassware, instruments, utensils, clothing, cloths, toilets and furniture. It may be used in the process of steam distillation often necessary in chemical laboratories and in small chemical plants. It will furnish a convenient steam supply for pressure cookers and small steam ovens, and can be used to supply industrial steam for other small-scale processes. Used as a still, it could produce on short order limited supplies of distilled water for drinking, for garages in isolated places, or for medicinal purposes. The generator can be used to raise the temperature of water to boiling, for dishwashing or for general use as a domestic hot water supply in dwellings.

RATING TABLE

Type	WL-740-1	WL-740-2	WL-740-3
Wattage	2000	1500	1000
Voltage	105–125	105–125	105–125
Capacity (pounds of water per hour)	5.7	4.2	3.46
Steam Temperature at Outlet (degrees Fahrenheit)	350	300	250

Classified Ads

Rate: Two Dollars for fifty words or less. 30 cents for each additional ten words or less.

COMMERCIAL LINE REFRIGERATOR DISPLAY CASES—Walk-in coolers and refrigerators; also, direct-draw mechanically-cooled beer coolers. Sell with Ehrlich compressors or with any other make. Attractive discounts; also financing arrangements to help sell. 70 years in business. Write for full information. Ehrlich Refrigerator Mfg. Co., St. Joseph, Mo.

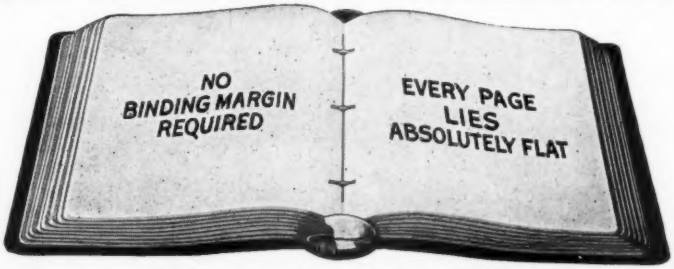
POSITION WANTED—Installing new or servicing old refrigeration equipment. I am a graduate of Utilities Engineering Institute and have had more than a year of experience in servicing, repairing and installing both commercial and domestic refrigeration equipment as spare time work. I am also an experienced electrician, at present employed by a Utility Company but prefer the refrigeration business. Address Box 101, THE REFRIGERATION SERVICE ENGINEER, 435 N. Waller Ave., Chicago, Ill.

POSITION WANTED—Ambitious young man, age 28, mechanically inclined, high school graduate and a practical course in air conditioning and refrigeration, desires opportunity in air conditioning and refrigeration field. Leonard Escltine, Bristol, Vt.

Index to Advertisements

BIND—your copies of
THE REFRIGERATION SERVICE ENGINEER
for Future Reference

ALL COPIES ARE PUNCHED TO FIT THIS BINDER



Every issue of this magazine will have valuable information which you will want to retain for future reference.

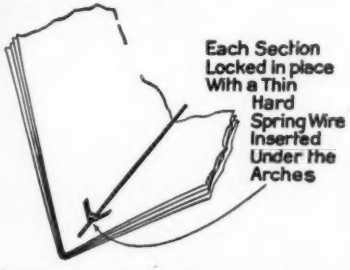
Here is a handy, substantial binder that permits you to add each copy readily as it is received. The binder is so constructed that regardless of the number of issues, every page lies flat and is easily read.

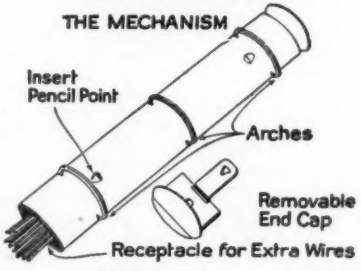
Holds twelve issues—an entire year's supply. No hunting around for lost or missing issues. The entire year's edition is always handy.

The name of the magazine is attractively stamped on the cover in gold.

HOLDS TWELVE COPIES

Only $1.25 Postpaid





It's simple—here is how it works

Each issue is locked in place with spring wire. It takes only an instant to add an issue. Reserve supply of extra wires for future issues is kept in the back-bone of the binder. File your copies promptly as received.

Send Your Remittance of $1.25 to

THE REFRIGERATION SERVICE ENGINEER
433 NORTH WALLER AVE. CHICAGO, ILL.

● Refrigeration Engineers and Service Men! Treat yourself to the "unusual experience" of reduced service costs! Your Parts Jobber will tell you that the best way to do so is to switch to A-P Thermostatic Expansion Valves on all installations. For A-P Valves have long ago proved this Dependability on every type and size of Air Conditioning and Refrigeration.

ALL MAKES REFRIGERATION
SALES & SERVICE, INC.

General Electric — Electrolux — Copeland — Commercial — Domestic — Air Conditioning
Sales — Service — Installation — Refrigeration

3457-9 MONTROSE AVENUE
Chicago, Ill.

February 1, 1939

Automatic Products Company
2450 North 32nd Street
Milwaukee, Wisconsin

Attention: Mr. E. A. Vallee

Dear Mr. Vallee:

Some time ago we started using A-P expansion valves exclusively and since that time have had no valve returned and not one removed for any reason from any installation.

This is the first times we have ever had an experience like this and we feel happy about it, of course, because it reduces our service expense.

Very truly yours,

ALL MAKES REFRIGERATION SALES & SERVICE

Fred H. Roth
President & Treasurer

"No Valves RETURNED or REMOVED . . ."

Since changing to AP

● Mr. Fred H. Roth
President & Treasurer

● The busy repair and parts shop of "All Makes Refrigeration Sales & Service, Inc."

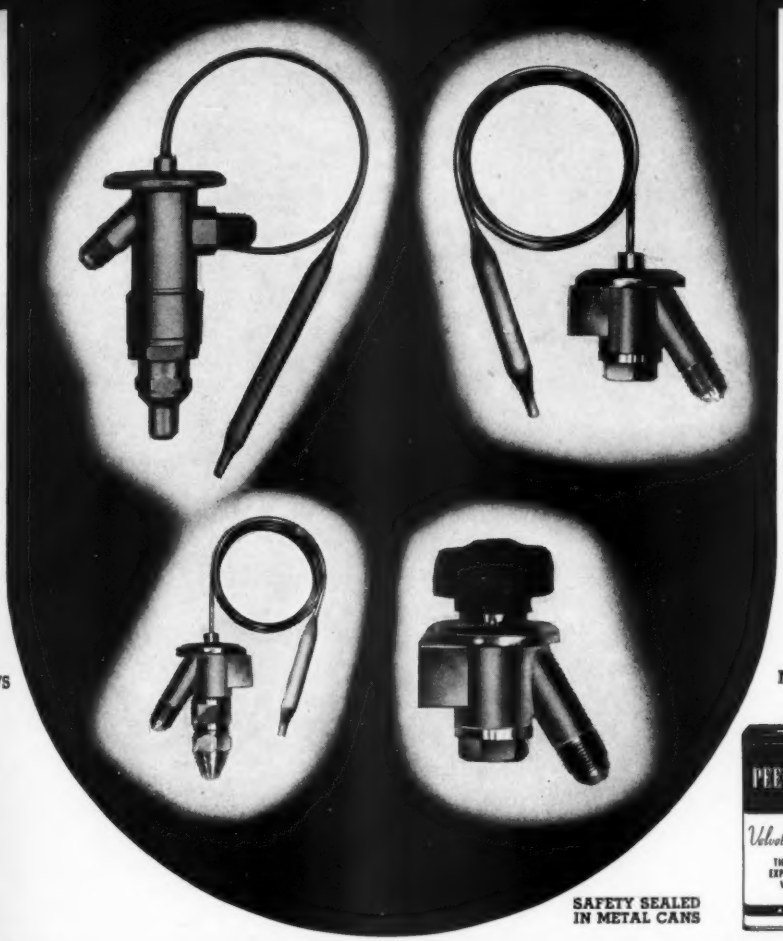
AP Model 205 — Thermostatic Expansion Valve

● Refrigeration Parts Jobbers, Who Recognize Quality, Stock A-P Controls

AUTOMATIC PRODUCTS COMPANY
2454 NORTH THIRTY-SECOND STREET
MILWAUKEE WISCONSIN

DEPENDABLE

THE BYWORD FOR A-P VALVES



EL V

MODEL VN

DEL VS

MODEL VA

SAFETY SEALED
IN METAL CANS

NEW PEERLESS VALVES

REMOVABLE ORIFICE CARTRIDGE—BY USING THE PROPER SIZE ORIFICE CARTRIDGE YOU CAN MATCH THE MODEL V OR VS VALVE TO THE COIL AT THE TIME OF INSTALLATION.

MODEL V THERMAL EXPANSION VALVE
WITH INTERCHANGEABLE ORIFICE CARTRIDGE

For those "hard to handle" jobs, the new Peerless Model V is pacing the field. It combines highly successful past performance with advanced engineering. It is now possible to match the valve to your equipment by using the PROPER SIZE ORIFICE CARTRIDGE.

MODEL VS THERMAL EXPANSION VALVE
WITH INTERCHANGEABLE ORIFICE CARTRIDGE

For those fussy small jobs, choose Model VS Valves. They are ideal for places where space is at a premium, yet requiring a man-size performance. The price offers a great saving.

Use The Proper Size Orifice Cartridge.

MODEL VN THERMAL EXPANSION VALVE
NON-ADJUSTABLE SUPERHEAT

Peerless Model VN Valves conform to specifications for factory-engineered refrigeration products. Maximum coil efficiency is assured by a predetermined superheat. It cannot be adjusted in the field.

MODEL VA AUTOMATIC EXPANSION VALVE
ADJUSTMENT RANGE 20" VAC. TO 30 LB. GAUGE

Peerless has designed the Model VA Valve for small evaporators, beverage coolers and jobs of similar capacity. Its fundamental purpose is to feed refrigerant into the evaporator in correct proportions to maintain maximum evaporator efficiency without frost-back to the compressor unit. The flow of the refrigerant is stopped during the off-period.

ASK YOUR JOBBER FOR DETAILS, OR WRITE FOR OUR CATALOG

PEERLESS OF AMERICA, INC.

MIDWEST FACTORY, GENERAL OFFICES—515 W. 35TH STREET, CHICAGO

NEW YORK FACTORY
43-20 34th STREET
LONG ISLAND CITY

PACIFIC COAST FACTORY
3000 SOUTH MAIN STREET
LOS ANGELES, CALIF.

SOUTHWEST FACTORY
2218 N. HARWOOD ST.
DALLAS, TEXAS

EXPORT DIVISION
P. O. BOX 636
DETROIT, MICH.